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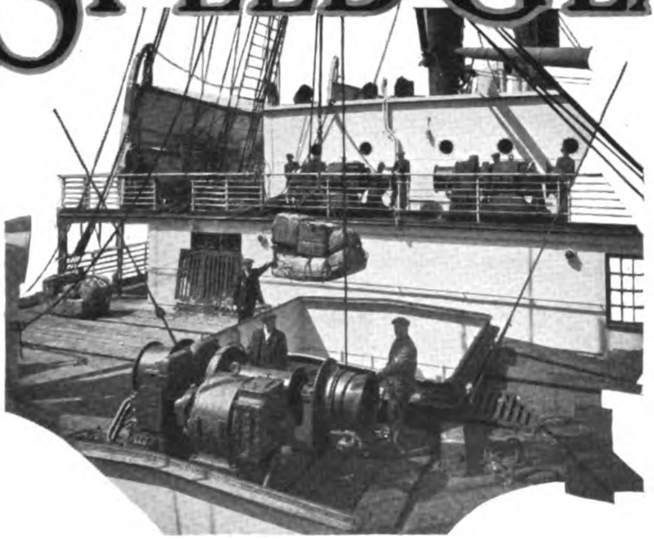

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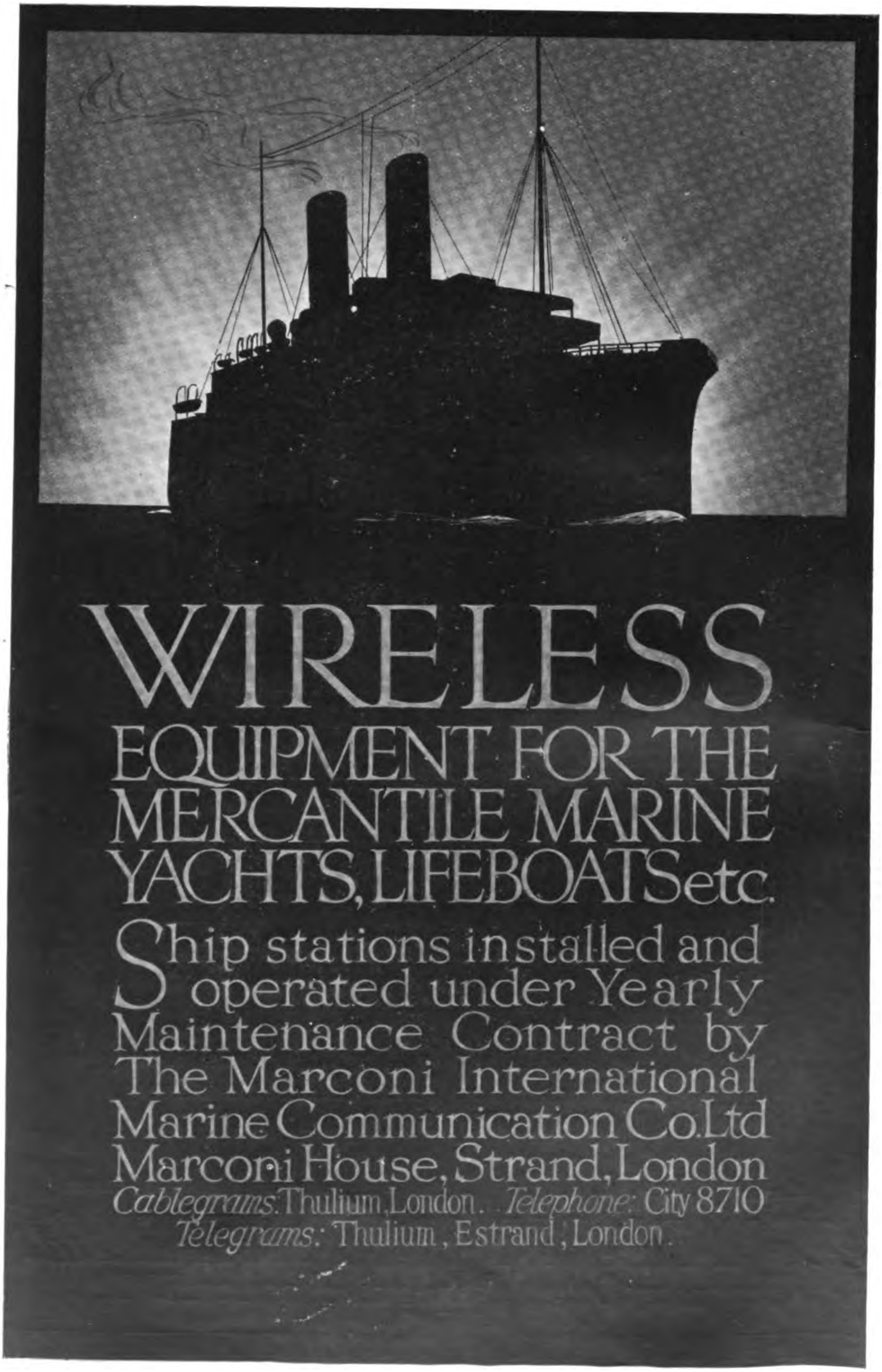

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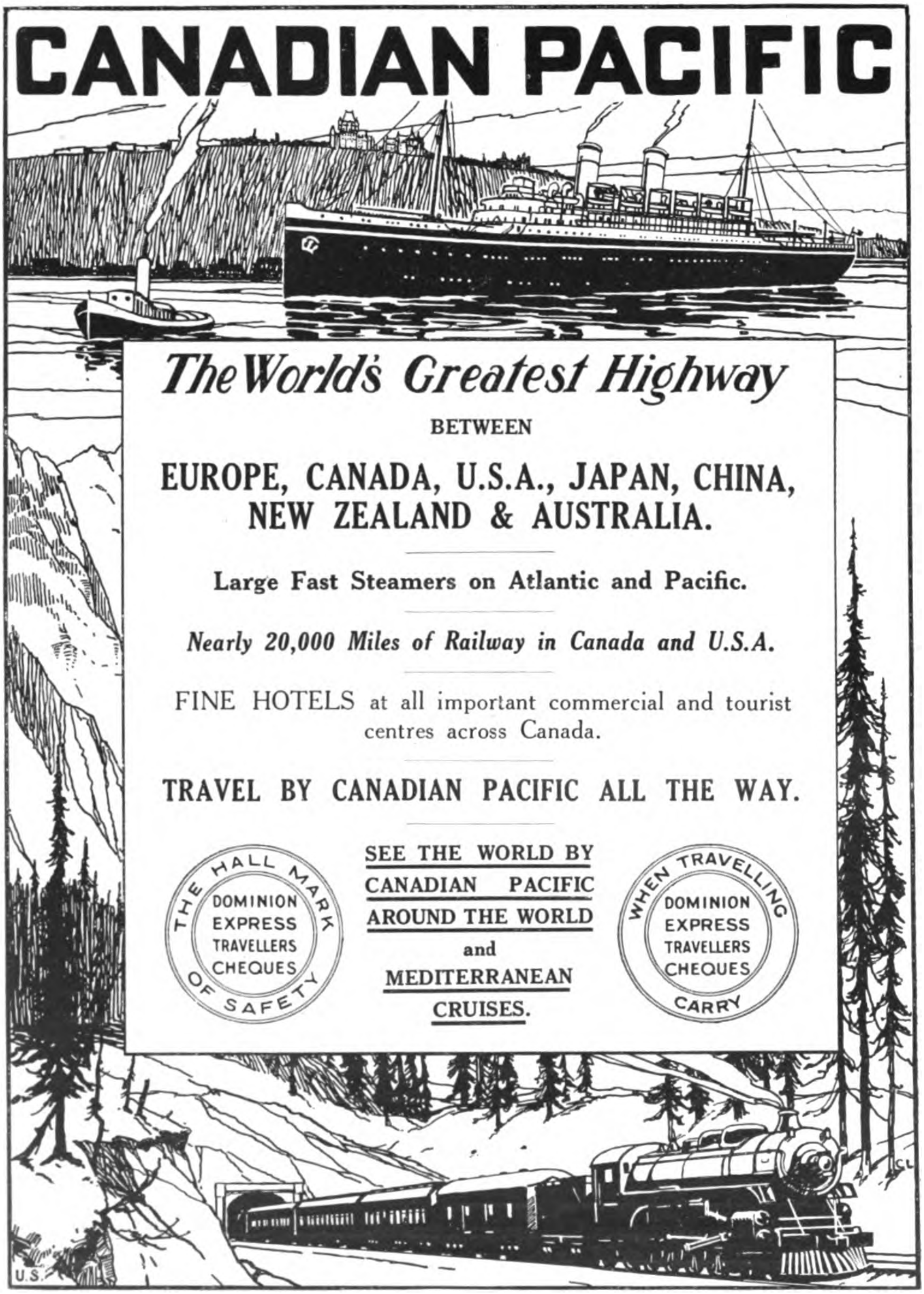

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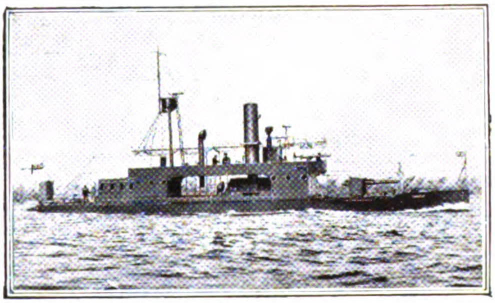

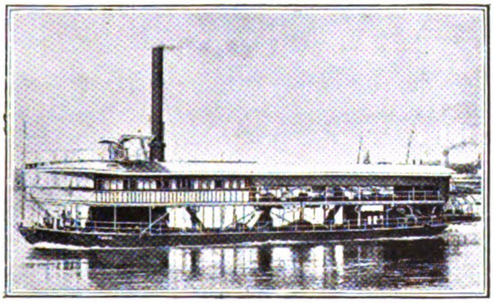

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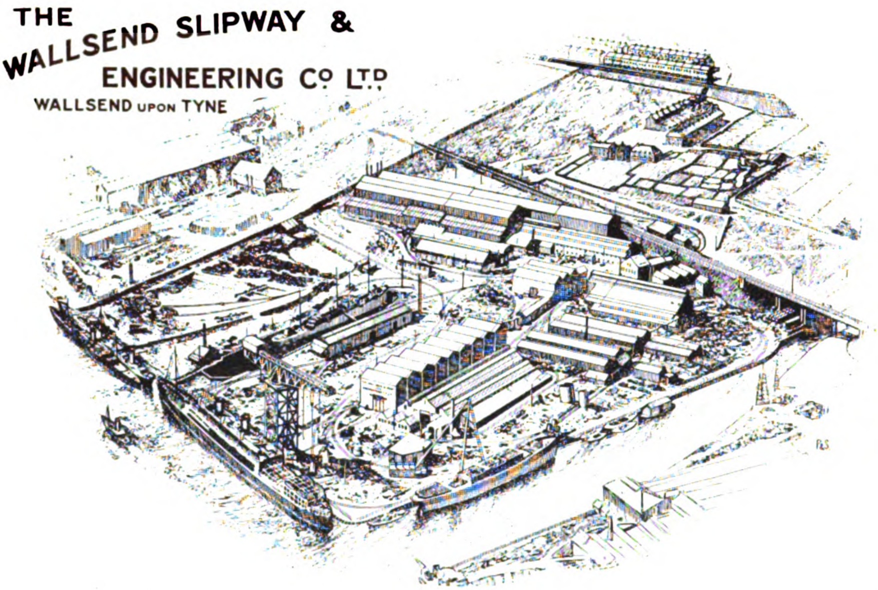

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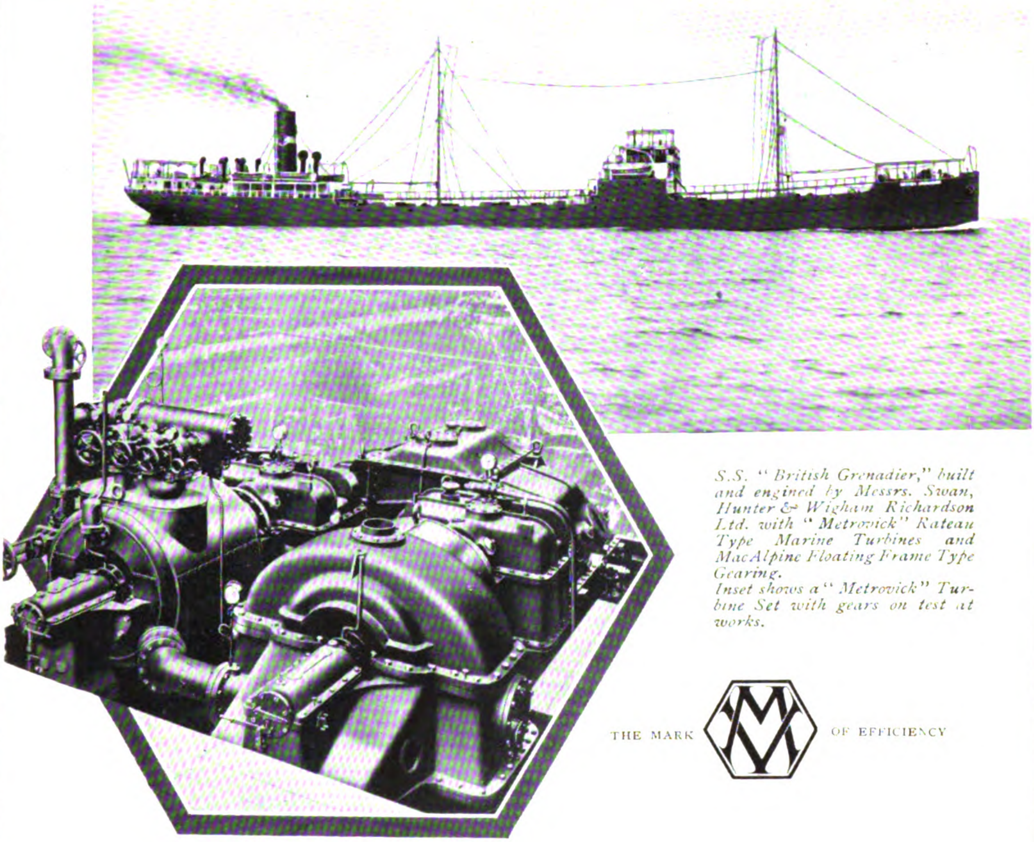

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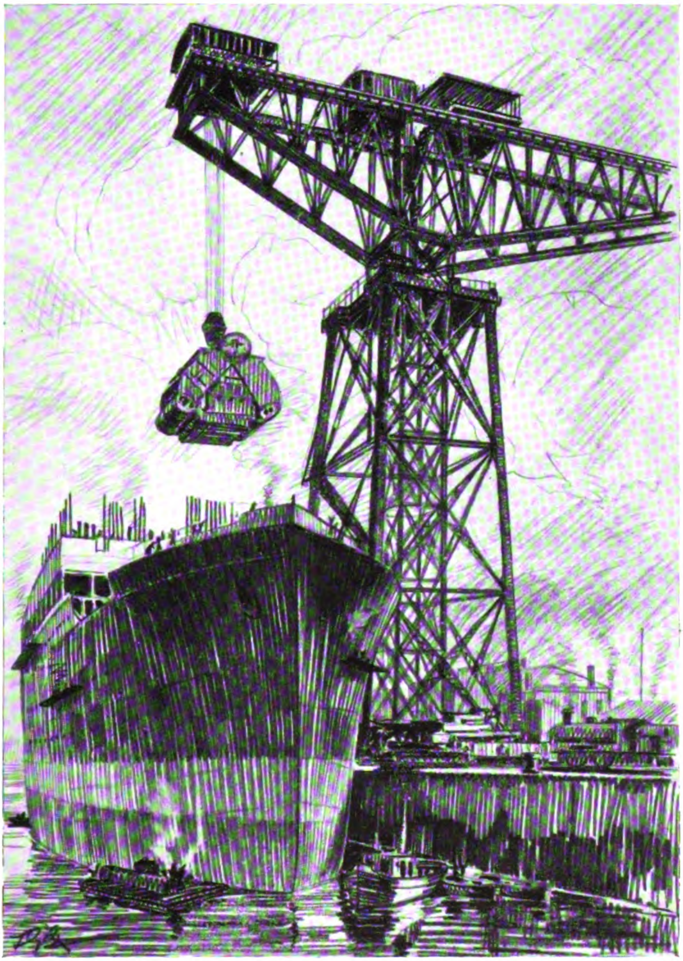

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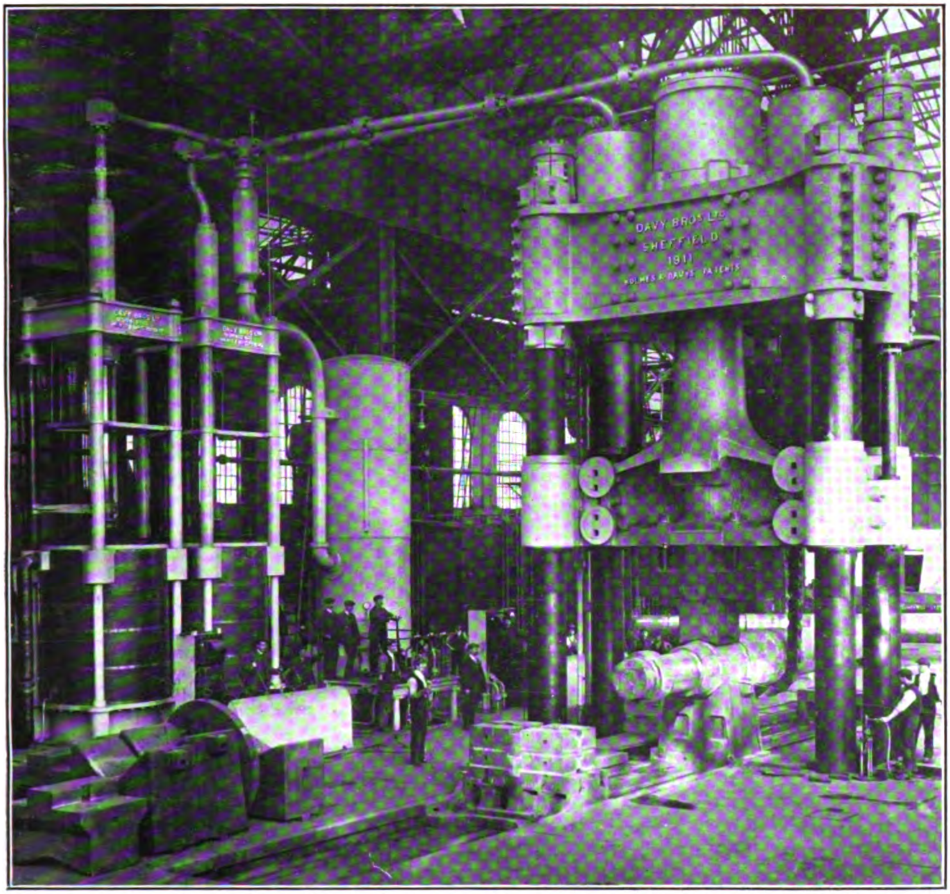

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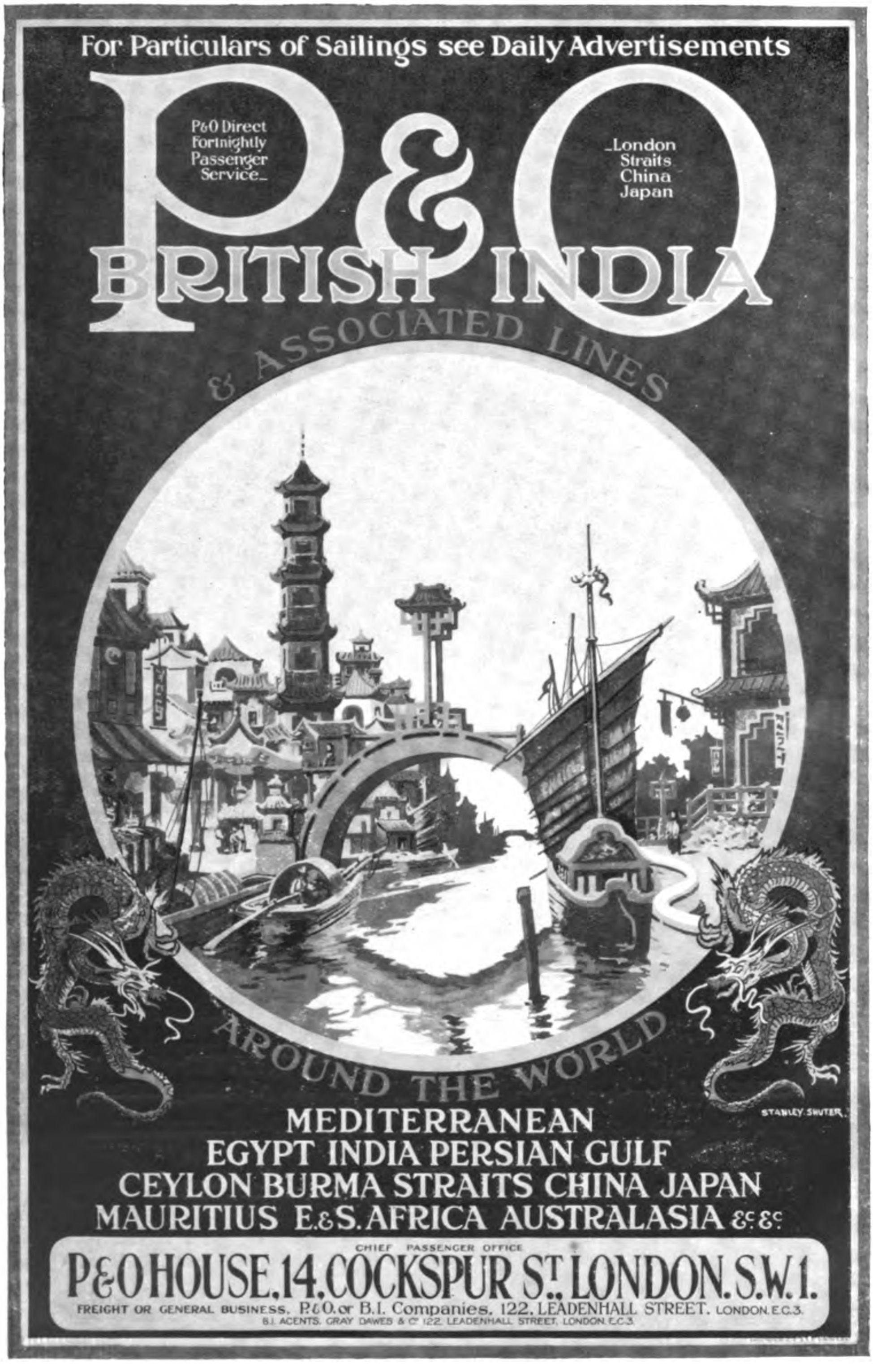

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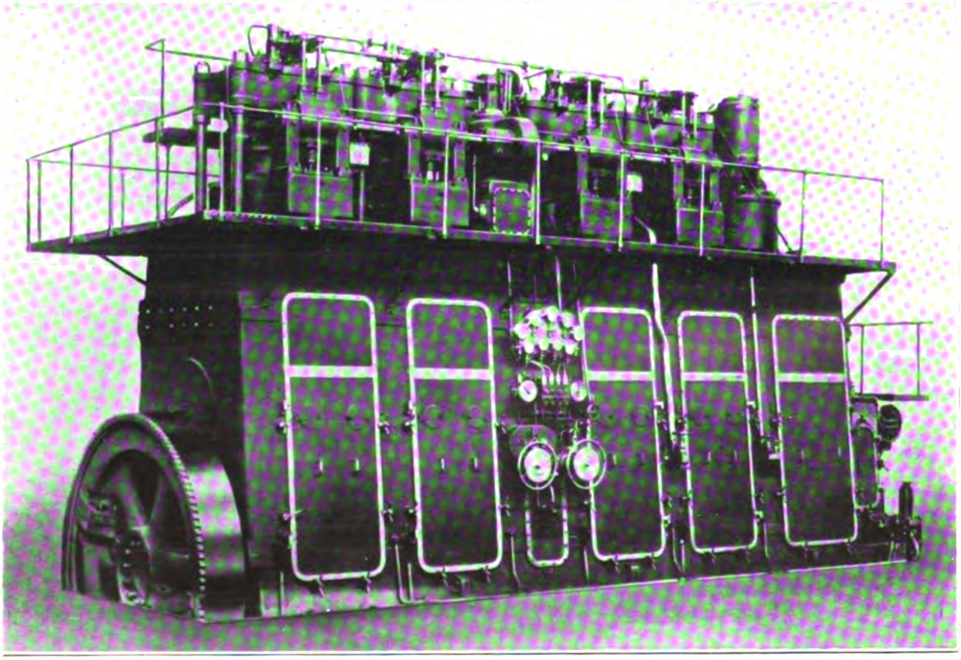

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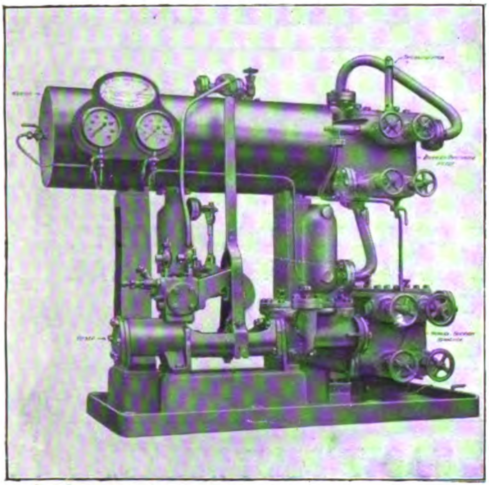

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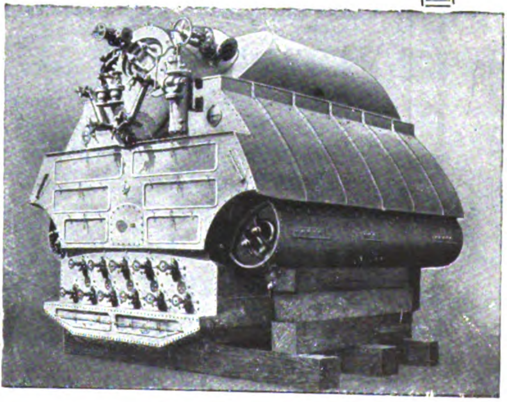

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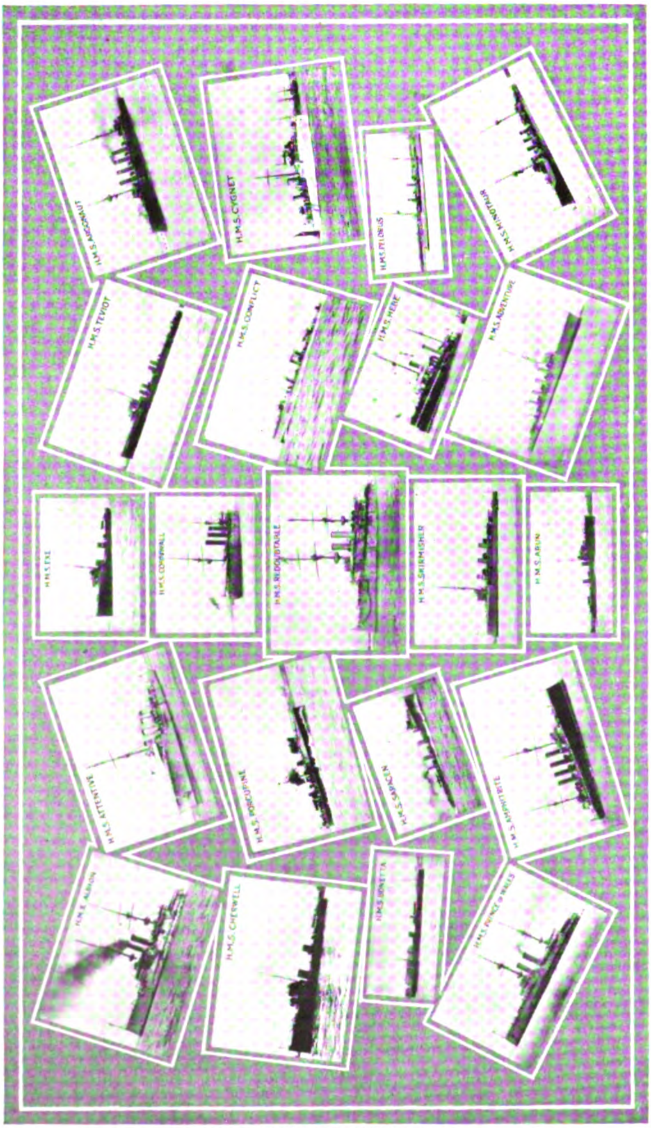

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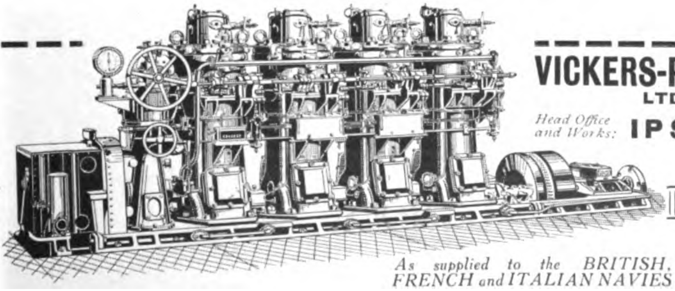

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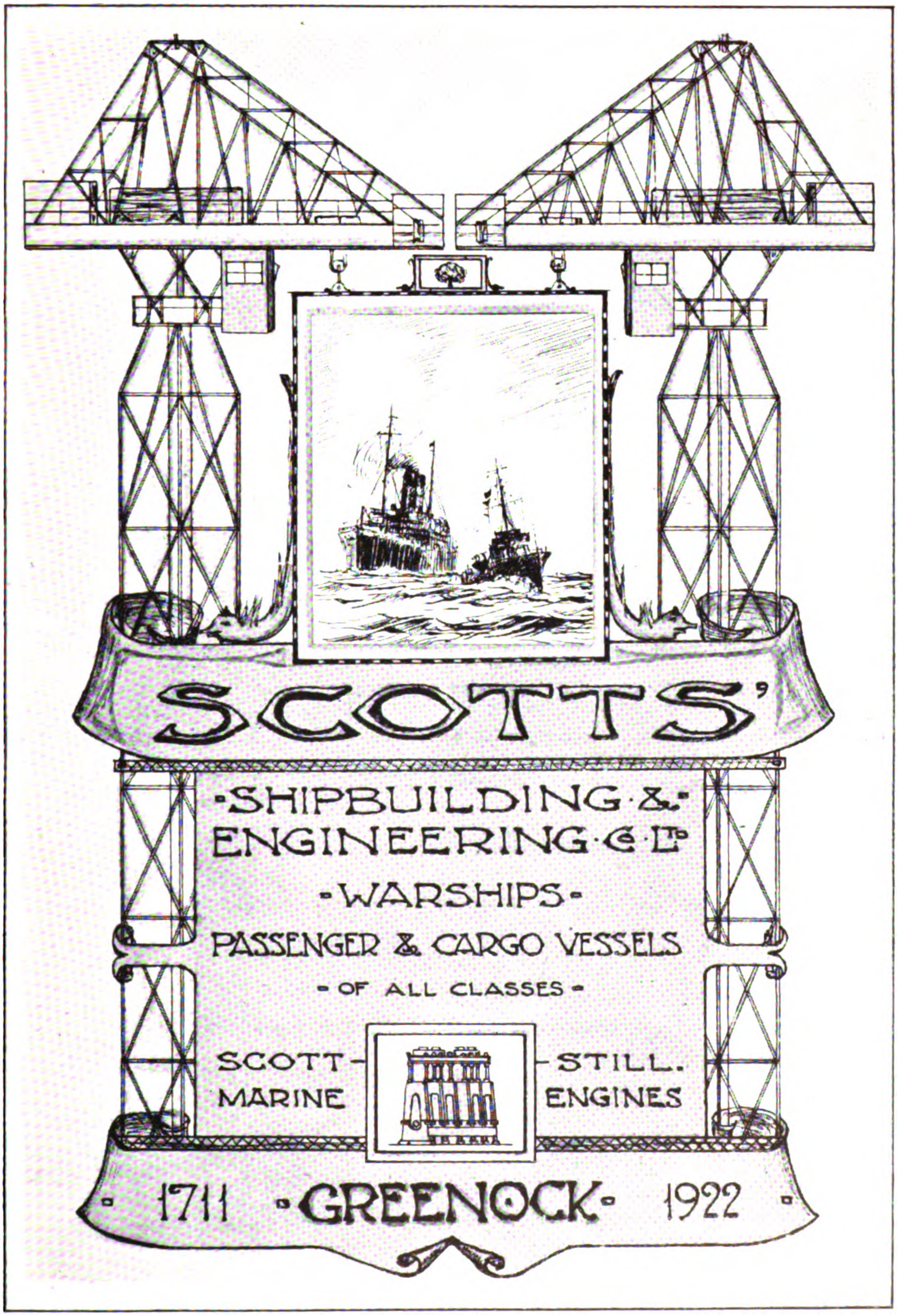
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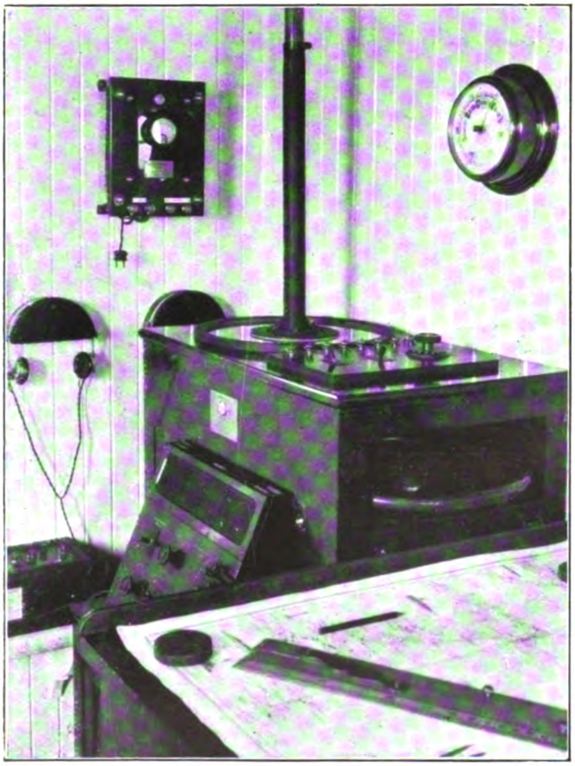

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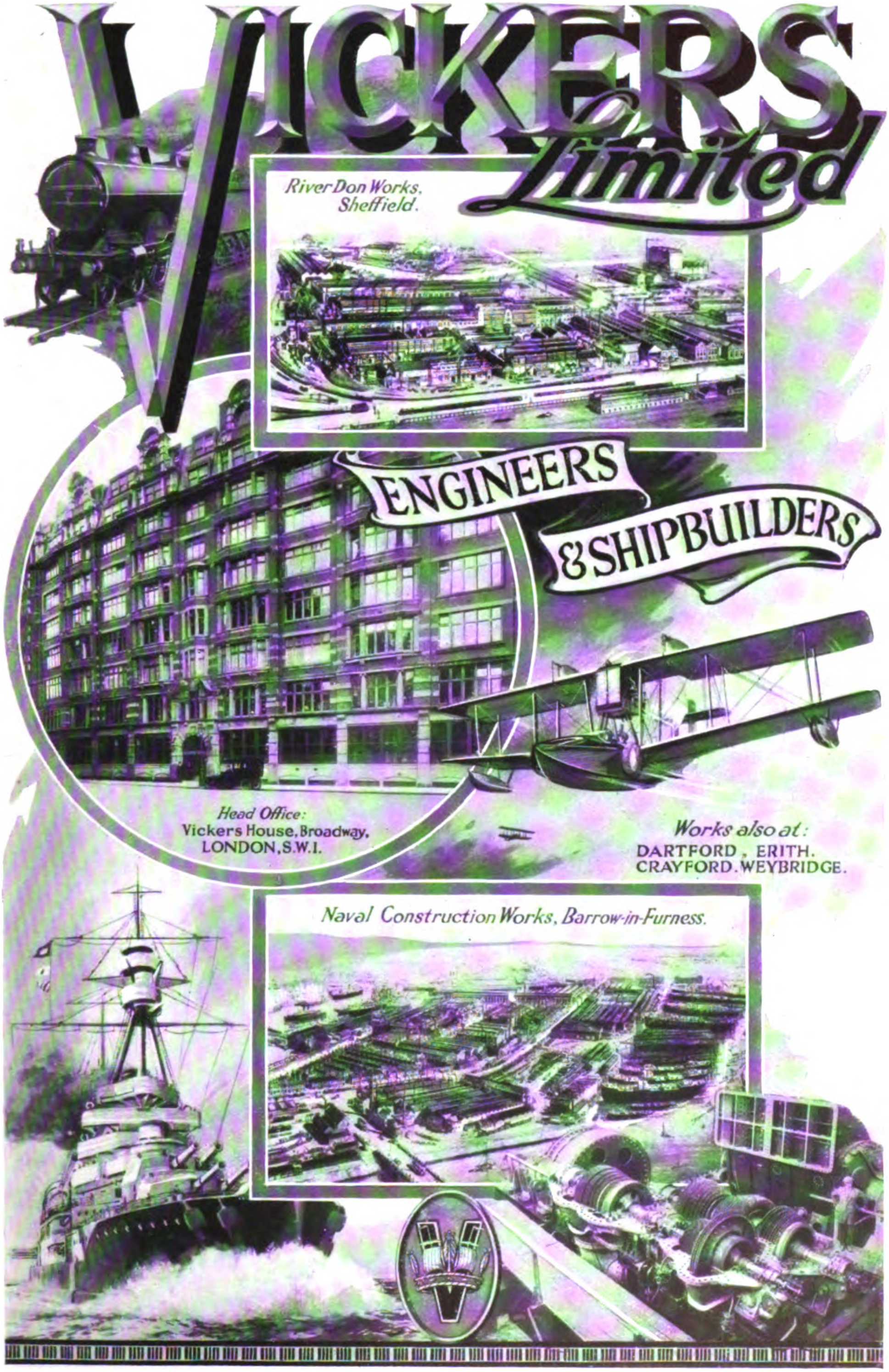
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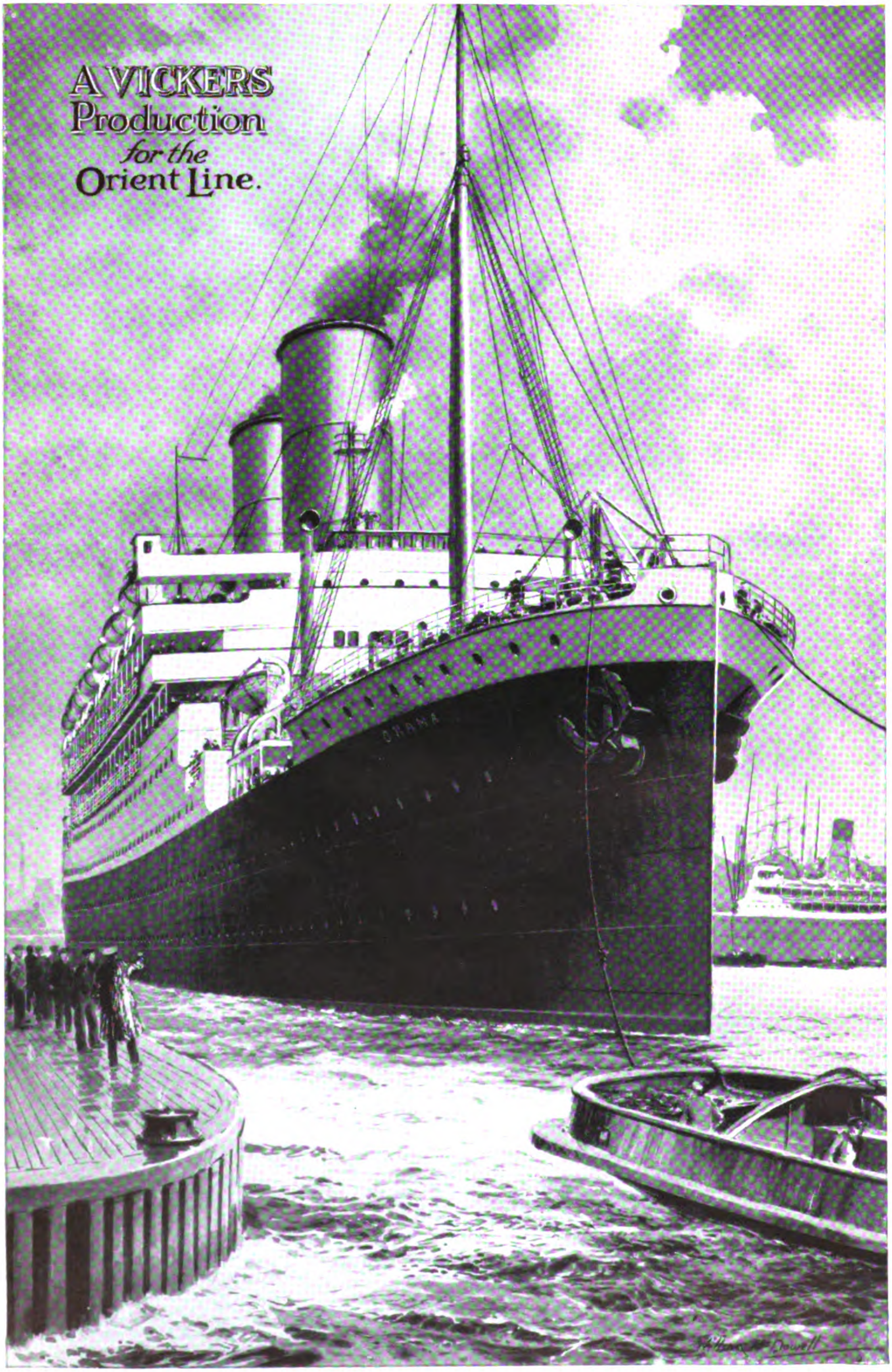
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1924.

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PREFACE.

WITH this volume, "Brassey's Naval and Shipping Annual" approaches more nearly to the conception of what such a volume should be if it is to fulfil its functions as a forum for the discussion of all matters of naval and shipping policy and an authoritative reference book, which can be turned to with confidence. Its scope has been gradually enlarged from year to year, and it is now the only publication in the English-speaking world of its kind—at one and the same time a medium for the discussion of current problems, a record of progress from year to year of the British and other Navies and of the great mercantile marines of the world, as well as a statistical barometer, and a book fully illustrating modern developments.

The "Annual" now consists of four main sections—naval, merchant shipping, and the profiles of warships and merchant ships of the world as they appear on the horizon when at sea—together with a comprehensive reference section. The decision to enlist the assistance of Mr. Arthur J. W. Burgess, R.I., R.O.I., as art editor, with special charge of the new profile section, has been justified by the appreciation which has been expressed of this new development.

All plans of British and foreign warships have been thoroughly revised and brought up to date as far as possible, involving new engravings in practically all cases. This revision is a work of increasing difficulty as, owing to the cessation of capital-ship building, reconstruction of existing vessels within the limits allowed by the Washington Treaty is being largely undertaken by several nations. This is evidenced in several of the plates, and especially in that of the French battleships of the Bretagne class, which with their tripod foremast now present a typically British appearance. The French Jean Bart class are also at present being reconstructed and will, when complete, be similar in appearance to the Bretagne class. Similarly, the appearance of the Italian battleships of the

Conte di Cavour class has been changed by moving the foremast forward of the fore funnel, and the pole foremast in the Dante Alighieri has been removed and replaced by a quadripod mast forward of the fore funnel. The Treaty of Washington having been ratified, all ships due for scrapping within eighteen months of this ratification have been excluded. The latest available plans of British and foreign light cruisers have been included, and it is hoped still further to improve the information given for this class of vessels in subsequent issues of the "Annual." By arrangement with the Director of Naval Construction (Sir Eustace Tennyson d'Eyncourt), the new plans have been prepared by Mr. F. T. Blackman, a member of the Royal Corps of Naval Constructors.

As the chapters contributed by Commander C. N. Robinson and Mr. John Leyland reveal, the ratification of the Washington Naval Treaty, far from arresting, as was anticipated in some quarters, all naval development, has tended merely to direct it into fresh channels. Except for the two British battleships, which are being built in accordance with that agreement, no capital ships are now under construction by any of the naval Powers. Increased attention, on the other hand, is being given to the building of light cruisers and submarines, as well as aircraft carriers. Japan is endeavouring to illustrate the offensive and defensive powers which can be developed in a light cruiser designed in accordance with the terms of the Naval Treaty, with a displacement of 10,000 tons and no heavier gun than the 8-inch weapon. As announced by the Prime Minister, several light cruisers are to be laid down for the British Fleet. It is understood that they will replace the existing "County" class, but will be more powerful vessels, displacing 10,000 tons. Some of the keels will probably be laid down early in 1924.

Simultaneously submarine design is making considerable progress abroad, but the Powers concerned in this movement are exhibiting some reticence as to their action. Attention is also being directed to the design of aircraft carriers, which, as in the case of light cruisers, is governed by the provisions of the Washington Treaty. The uncertainty existing as to the final form which the aircraft carrier may take lends peculiar importance to the chapter in this issue by Mr. H. G. Williams (of Messrs. Armstrong, Whitworth & Co.).

The Naval Section is more controversial in its character than in former volumes, and in this respect it reflects the unsettled state of opinion on various matters of policy in every maritime country. An article which is sure to excite widespread interest deals with the Jutland controversy. It consists of a detailed examination of all the questions which the literature of the battle, now of considerable volume, has raised not only in British but in foreign circles. It opens appropriately with a review of the first communiqués issued by the Admiralty, and traces, so far as it is possible to do so, the origins and development of the criticisms which have been expressed on the manner in which the battle was fought, and in particular on the action of the Commander-in-Chief—his method of deployment and his turn-away from the enemy's torpedo attack. The author then examines a further question: are those problems upon which critics have been so insistent, the most important questions arising out of the conduct of the battle? Does not the destruction of two battle cruisers by a force inferior to them in numbers, speed, and gun-power call for more examination than it has hitherto received? Is the current explanation that those disasters were due to the construction of our ships satisfactory?

Brigadier-General Bagnall-Wild deals with another somewhat controversial subject in his contribution on "The Trend of Research and Design in Aircraft Engineering." In its mechanical aspects, aviation is still in its infancy, and the writer gathers up the experience of the immediate past in order to furnish sure foundations for future development. Directional wireless is certain to have considerable influence on the navigation of ships of war and ships of commerce, as well as upon the employment of aircraft. Professor W. H. Eccles, F.R.S., than whom there is no higher authority on wireless telegraphy, traces the scientific progress of directional wireless and makes a survey of recent developments which will excite curiosity, and something more than curiosity, as to the extent to which directional wireless can be pressed into the service of humanity. Mr. L. Miller, of the Metropolitan-Vickers Company, discusses the subject of electric propulsion of ships. At the moment, the internal-combustion engine for marine purposes is occupying the minds of ship designers, naval and mercantile, but, as Mr. Miller indicates, electrical propulsion is no longer a dream, but an actuality. What its future may be depends upon a number of factors which the author examines with fullness of information and considerable practical experience.

Two historical chapters conclude the Naval Section. Mr. Archibald Colbeck's discussion of the development of blockade policy constitutes a valuable contribution to a subject which is likely to be increasingly discussed as the memories of the Great War become dim and its implications are impartially examined in this and other countries. Mr. Colbeck protests against any comparison which only contrasts our practice in 1914 with that of the Napoleonic wars. He insists that before it can be decided whether belligerent rights at sea have increased or decreased, we must carry our inquiries much further back; and he compares our blockade of Germany with our attempt to blockade the coasts of France between 1689 and 1697.

Mr. R. W. Dana traces the history of the Institution of Naval Architects, and, as its indefatigible secretary for many years, he records with restrained pride its notable achievements. Finally, there is a "Note" in appreciation of the work of Sir Julian Corbett, who passed away just as he had completed the third volume of "Naval Operations," the official history of the war by sea, on which he had been engaged for six years.

Sir Westcott Abell, Chief Ship Surveyor of Lloyd's Register, again contributes the first chapter of the Merchant Shipping Section, in which he traces the most recent developments of the merchant fleets of the world. He has something to say of the difficulties which have been experienced on the other side of the Atlantic in dealing with the large volume of merchant tonnage which was built by the United States Government during the war, and completed too late to influence its issue. Sir Westcott Abell also records the remarkable recovery of Germany as a sea-carrying power. Under the Treaty of Versailles, she surrendered practically all her tonnage of any account, but by resorting to subsidies and other expedients, she has already replaced a considerable portion of her mercantile fleet, and is no longer to be regarded as a negligible competitor in the sea-carrying trade.

Sir Leslie Scott, the late Solicitor-General, who has rendered such conspicuous service to the shipping industry, contributes an important chapter on shipping and international law. The lawyers of the world have been engaged since the conclusion of peace in a renewed effort to codify and unify the laws applying to the sea-carrying trade, and Sir Leslie Scott indicates the progress which has already been made and the hopes which are entertained for the future. On page 577 there is given the official report of the meetings on shipping of the Imperial Conference in October and November, as well as the resolutions carried, and this should be read in conjunction with Sir Leslie Scott's chapter.

In former volumes of the "Annual" Mr. James Richardson has discussed engineering problems as they present themselves to the shipbuilder and the shipowner; on this occasion he deals specifically with the trend of developments engendered by the intensely severe competition in freight carrying and by the depression generally in the world's trade. The remarkable progress of the motor ship and its ever widening scope are described in detail.

Succeeding chapters are concerned with the various aspects of policy which are engaging the attention of all who are interested in merchant shipping, this country's basic industry in view of its insularity. What is the future of the tramp steamer? How should merchant seamen be trained? What is the bearing of recent tank experiments on current shipbuilding practice? These questions are dealt with by Mr. J. Howard Glover, whose family has been for so long associated with tramp shipping; by Captain Selwyn M. Day, who, as a practical seaman, has given close study to the training of seamen in the mercantile marine; and by Mr. G. S. Baker, who is in charge of the Experiment Tank at the National Physical Laboratory at Teddington. Mr. B. Binyon, in an article of great interest, deals with the possibilities residing in directional wireless in its application to the navigation of merchant ships and the increase of safety and regularity of service resulting therefrom.

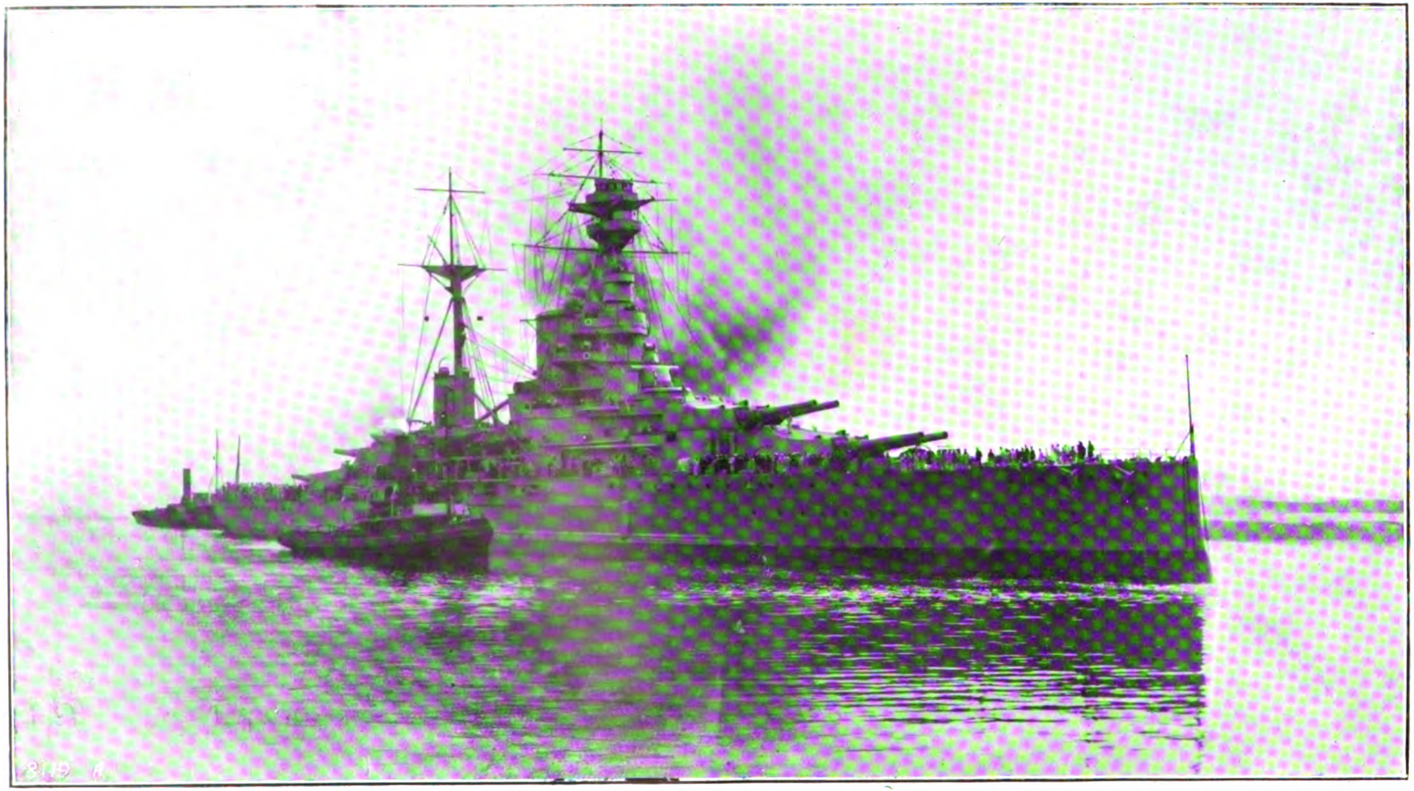
Two other chapters contain statements which will come as something of a surprise even to those who are most closely associated with merchant shipping. Dr. L. Isserlis, the statistician of the Chamber of Shipping of the United Kingdom, traces the rise and fall of ship values during the past few years, an accompanying diagram graphically illustrating the remarkable movements which have occurred. In what may be regarded as a complementary article, Mr. Cuthbert Maughan discusses the low costs of sea transport, reminding readers of the solid advantages which flow from access to the sea and free use of the international freight market. Mr. R. W. Johnson records, with a wealth of statistical information, the downward movement of freights during the past twelve months; and Mr. C. Ernest Fayle, the author of "Seaborne Commerce," one of the official histories of the war, discusses "Shipping and Policy."

In this issue of "Brassey's Naval and Shipping Annual," a new series of chapters describing the history and development of the great mercantile ports of the United Kingdom is begun. Viscount Devonport, who has been the far-seeing chairman of the Port of London Authority since its establishment, writes upon the port of the capital of the British Empire, recalling its past and suggesting what its future may be.

Thanks are due to a wide circle of naval officers, shipbuilders, shipowners and others, as well as to the Admiralty, the Air Ministry, and Lloyd's Register of Shipping, for the assistance given in increasing the scope and raising the prestige of the "Annual." It need hardly be added that suggestions, as well as criticisms, are always welcome.

ALEXANDER RICHARDSON.
ARCHIBALD HURD.

NAVAL SECTION.



THE LATEST TYPE OF BATTLESHIP FOR THE BRITISH NAVY: H.M.S. RAMILLIES OF THE ROYAL-SOVEREIGN CLASS.

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(For particulars see pp. 423 and 479.)

CHAPTER I.

THE BRITISH NAVY.

THE chief topics of discussion in regard to British naval affairs since the appearance of the last issue of the "Annual" have been the provision of a new base at Singapore, and the relations of the Admiralty and Air Ministry in connection with the control of the air arm of the Fleet. But in the sphere of actual events, the withdrawal of Atlantic Fleet ships from the Mediterranean, following the conclusion of peace with Turkey, takes a prominent place, making possible as it does a redistribution of the Fleet on the original post-war lines.

In the realm of organisation, the past year has not been uneventful, having seen the accomplishment of the plan, long under consideration, for the amalgamation of the Royal Marine Artillery and Royal Marine Light Infantry; and also the transfer of the greater part of the Coastguard Force to civilian hands under the administration of the Board of Trade and the Department of Customs and Excise.

From the standpoint of material, there is to be recorded the construction of the two capital ships allowed by the Washington Treaty, but except for these vessels no construction for the Royal Navy is going on in the great private shipyards of the country, and the decline of our resources which this fact indicates has become a matter of serious import.

As for the personnel, the heavy retrenchments of 1922, following those made in the three preceding years, are indicated by the maximum having been brought down to 99,500, the lowest number voted in any year since 1896. In short, as Mr. Amery, the First Lord, said at the Academy Banquet in May 1923, the great Fleet on which the whole strategy of these islands was based in the late war has passed away, little more than a mere nucleus remaining to keep alive the traditions of the past and to provide a foundation for the Navy of the future.

DEVELOPMENT OF SINGAPORE.

It was in June 1921, that the Government of the day decided that the naval base at Singapore should be developed to meet the needs of a modern Fleet, and the first public indication of this was given in the House of Commons on October 27, 1921, by Mr. Lloyd George, who said that, for the better security of outlying possessions, certain bases abroad, including those in the Pacific, needed modernising, and in some cases extending; and that the

Imperial Conference generally agreed with this policy. In February 1923, this policy was reaffirmed by the new Government, and in the First Lord's Statement Explanatory of the Navy Estimates, dated February 27, 1923,* the decision to proceed gradually with the development of the naval base at Singapore was announced, £200,000 having been included in the Estimates for the purpose.

When introducing the Estimates in the House of Commons, Mr. Amery pointed out that the main task of the Navy was not to act as coastguard to the United Kingdom, but to keep open everywhere the sea whose freedom was our very life-breath. The Navy must be free to go anywhere, but it was not free to do so at present, "because it had neither the supplies of oil nor the docking or repairing facilities required to give it the necessary mobility. We could neither send a battle fleet to the Far East nor maintain it there. It was to remedy that defect that the Admiralty were gradually building up our chain of oil reserves at strategical centres, and were beginning the creation at Singapore of a naval base capable of dealing with the requirements of a fleet of modern capital ships."

The Admiralty's Scheme.

This announcement of the Government's intentions led to a discussion in the House, followed by a somewhat lively controversy in the Press. The value of the criticisms was largely discounted by want of knowledge of what was proposed, many of those who participated in the discussion supposing that it was intended to increase the existing docks and extend the site of the present base, whereas an entirely different locality has been chosen. The new dockyard and graving dock, the Secretary of the Admiralty stated on June 20, will be established in the Old Strait, that piece of water separating the island of Singapore from the mainland. The existing graving dock at Singapore can accommodate vessels up to 850 ft. in length, 92 ft. beam, and 32 ft. draught. It is, therefore, unable to take the two ships of the Rodney class, now building, five Royal Sovereigns, two Renowns, five Queen Elizabeths (with bulges), the Hood, or the Eagle—a total of sixteen of the principal vessels of the Fleet. Moreover, damaged capital ships or aircraft carriers may draw up to 45 ft. of water; we cannot, therefore, rely on a dock whose maximum draught is only 33 ft.

Position of the New Base.

On July 11, the First Lord informed the House of Commons that, with the concurrence of the unofficial members of the Executive and Legislative Councils of the Colony, the site selected both for the naval base and for the aerodrome would be acquired by the Government of the Straits Settlements and handed over as a free gift. A message was sent to Sir Laurence Guillemard, the Governor of the Straits Settlements, expressing the warm appreciation of H.M. Government for this generous and patriotic decision on the part of the Colony. The position of the base in the Old Strait will be about three miles east of the causeway between the island and the mainland of Johore. It is proposed to provide a graving dock and a floating dock, with the necessary workshops and storehouses to enable these docks to be used and the Fleet to obtain its necessary supplies. It is hoped to be able to let the main contract early in 1925. The estimated approximate cost of the graving dock is about £1,000,000 sterling. It will be capable, if required, of taking two vessels at a time of the maximum size allowed under the Washington Treaty. There was a suggestion on the part of some critics that a floating dock at Singapore would serve the purpose. The cost of such a dock would, however, be as much as that of a graving dock, and it would need the same facilities on shore to make it of value. It is probable, as the First Lord said in Committee of Supply, that in addition to the graving dock a floating dock will also be placed at Singapore. It would be ridiculous to wait until an emergency arose before taking steps to do this, however, for the removal of such an unwieldy craft as a dock of this character, over thousands of miles, including probably a submarine-infested area, would be an enormous, if not impossible, task.

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* The text of the First Lord's Statement is published in the Reference Section.

OBJECTIONS TO THE PROJECT.

The objections raised to the provision of the new base were political, financial, hygienic, and geographical. Under the first-named head, it was stated that the proposal was contrary to the spirit of the Washington Treaty and constituted a flout to the League of Nations. This the First Lord stoutly denied, affirming that in the discussion at Washington it was clearly understood that Singapore was outside the region to which the self-denying ordinance not to establish or develop bases applied. In accordance with this arrangement, we had ceased to develop Hong Kong, but Japan was not precluded from developing a base on her mainland, nor the United States from strengthening her strong defences on the Panama Canal, in the Hawaiian Islands, or on her mainland; in face of incontrovertible proof to the contrary, this line of criticism has been perforce abandoned. As to the League, the success it had achieved had been owing to the unfailing support which it had received from this country and the Dominions. One of the chief objects of the League was to prevent war by co-operation against wanton aggression, but we could not co-operate against it unless we had some force with which to give effect to our policy. "The League had never set itself up to be a League of the helpless."

QUESTIONS OF FINANCE AND HYGIENE.

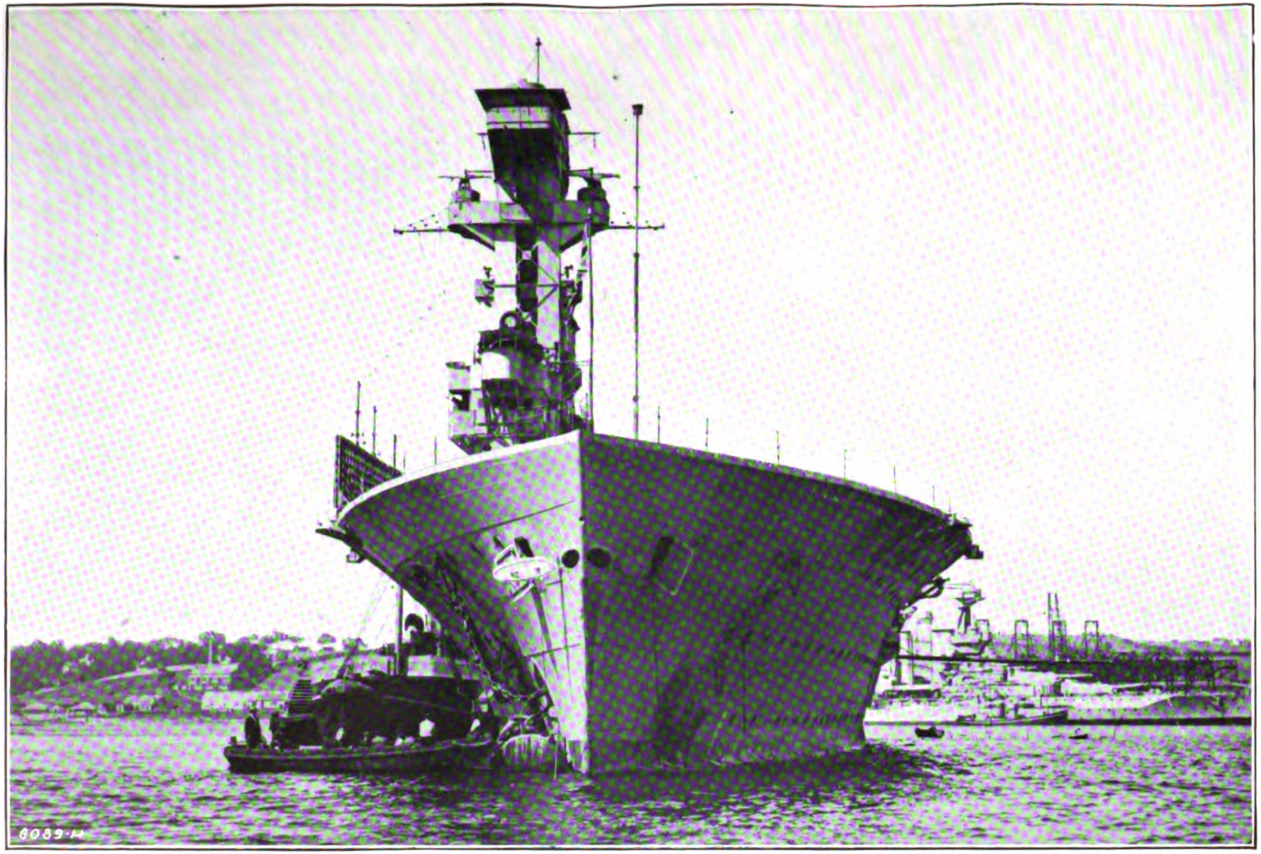
The financial objection was complicated by a revival of the controversy that battleships are not wanted in modern naval warfare, and it was suggested in many quarters that the money to be spent at Singapore ought instead to be devoted to submarines and aircraft. This, indeed, actually formed the subject of a motion in the House of Lords on June 5, 1923, when Lord Wimborne declared that, while we were thinking in terms of sea-power, we were neglecting the possibilities of the infant weapon of the air. But as Lord Salisbury, replying for the Government, pointed out, our Dominions could not be defended alone by aircraft, the area of which was so strictly limited. As to the position of the battleship, of course, the new works at Singapore will be needed quite as much for battle-cruisers, for the larger light cruisers, and for aircraft carriers. The disadvantages of Singapore on hygienic grounds need not concern us, for it is not usual for the Fleet bases to be arranged from this point of view. Although Captain Hay, M.P., spoke in the House of wasting men and money "in what was nothing but a pestilential and immoral cesspool," naval men know how much weight to attach to such a statement. It is not as if Singapore were now being selected as a naval station for the first time. It was among the coaling stations enlarged and fortified in the 'eighties of the last century, and twenty years ago it was named by Lord Fisher as the natural strategic centre of the Eastern Fleet, with squadrons in China, Australia, and the East Indies.

THE STRATEGIC SITUATION OF SINGAPORE.

This brings us to what may be termed the geographical objection, and the view that a base in Australia would have been more suitable. In considering the question of locality, distances must be taken into account. Singapore is 8,000 miles from England by the Canal route. The distance from Japan is 3,000 miles. If, therefore, the Fleet is kept at home, and trouble should arise in the Far East, the Japanese would have the advantage of being 5,000 miles nearer to our most advanced base. On the other hand, if it be assumed that the purpose of Japan would be to attack Sydney or some other point in Australia, and our Fleet was at Singapore, it would have about 4,000 miles to cover, which is little less than the distance the Japanese Fleet would have to travel. Both fleets would arrive about the same time, and equally short of fuel, which is, of course, an absurd conclusion. For if the Japanese Fleet went to Australia it would leave its own mainland without an adequate defence. A British Fleet at Singapore is, therefore, the obvious protection of Australasian ports. Given this fact, there has been little criticism of the decision to place the new dockyard on the northern side of the island, or on the opposite side to the existing commercial harbour. Questions of protection, no doubt, entered chiefly into this matter, for the old harbour is commanded by many islands in the neighbourhood, and under modern conditions it is necessary to have docks, oil tanks, wireless stations and the like in places where they are not exposed to sea attack.

THE NAVY AND THE AIR.

In introducing the Navy Estimates in March 1923, Mr. Amery wrote in his Explanatory Statement that the reductions in personnel were expected to be complete by April 1, "except for 140 officers



(*Photo: Abrahams & Sons, Devonport.*)

THE LATEST TYPE OF AIRCRAFT CARRIER FOR THE BRITISH NAVY: H.M.S. HERMES (BOW VIEW).

(*Constructed by Messrs. Armstrong, Whitworth & Co., Ltd., Walker-on-Tyne.*)
(*For particulars see p. 428.*)

and 1000 men who are being retained pending the final decision of the Government on the Admiralty proposal that the Navy shall in future provide the personnel for its own air arm." Towards the end of July, 1923, when it became known that the Sub-Committee of the Imperial Defence Committee, to which this matter had been referred, had reported adversely to the Admiralty, considerable discussion arose in the newspapers and elsewhere. There were reports, obviously premature, that unless the Navy obtained control of its own air units, the Sea Lords would resign. On the day these reports were circulated, although there was only a "thin" House, nearly thirty members of the Conservative party signed the following letter which a deputation took to the Chief Government Whip:—"We, the undersigned members of the Conservative Party, desire to intimate to the Government that we support the Admiralty in its demand for naval control of the personnel of its own air arm." The Navy League also, in the interests of our naval efficiency, upheld the views of the Admiralty.

In a document which was published in certain newspapers, it was pointed out that the Admiralty case was based on the wording of the Letters Patent for appointing the Lords Commissioners of the Admiralty. These Letters Patent give full authority to the Commissioners in all things which concern His Majesty's Navy, and impose upon them the responsibility of seeing that the Navy is in all respects efficient. "So long as these Letters Patent are in existence," ran the document, "the Board is unable to divest itself of any shred of responsibility for the efficiency of the Navy, nor is it permissible for them to share that responsibility with another department of State." Apart from this sole responsibility, the Admiralty were emphatic that dual control in this matter would be nothing short of disastrous to our naval power and the Empire. "Divided naval responsibility would lead to defeat in war, and no Board could possibly submit to such principles of organisation, including training." To sum up, the Admiralty's claim was "that the Fleet air arm is an integral part of the Fleet, and as such it should be solely an Admiralty responsibility, being administered and trained by them in a similar manner to every other arm of the Fleet."

DEFECTS OF DUAL CONTROL.

Since 1918, the personnel manning the units working from aircraft carriers has been an air, and not a naval, personnel, looking to the Air Ministry for advancement, and having different traditions and customs to those of the Fleet. Though they have been subject to the Naval Discipline Act, the Air Ministry's views have to be considered in regard to offences and punishment, and the latter are consequently often judged from a different standpoint. The personnel has usually insufficient work, for when not engaged in flying its members are not available for naval duties, even though they include engineer and store officers who duplicate such branches in the Navy. In the vital matter of efficiency, naval flying work involves knowledge and experience of fleet gunnery, torpedo, reconnaissance, and tactical problems which the Admiralty alone can impart, and which is not to be easily acquired by officers and men who only go to sea for a time, and look rather to service on the land. The fact, moreover, that the captain of an aircraft carrier is not able to commend officially an officer or airman constitutes a lack of incentive to excel. Other defects might be enumerated, but that a strong case had been made out for some alteration of the system was undeniable.

It was suggested that one means of surmounting at least some of the difficulties in question would be the appointment of a Minister of Defence, to whom the Ministerial heads of the three fighting Services should be subordinate. An alternative plan was the amalgamation of the three fighting forces. Both these proposals were referred to a Sub-Committee of the Committee of Imperial Defence and rejected as impracticable, but new provisions for strengthening the position of the Committee of Imperial Defence and its Chairman, and for securing the joint advice of the chiefs of the three staffs, were contained in papers laid on the table of the House of Commons on August 2, 1923.

THE BALFOUR REPORT.

The Sub-Committee which considered the relations of the Navy and Air Force consisted of Lord Balfour, a former First Lord, Lord Weir, a former Air Minister, and Lord Peel, a member of the existing Cabinet. They heard 16 witnesses and considered 19 memoranda, and the decisions of the Government on their recommendations were announced by the Prime Minister on August 2. Mr. Baldwin said:

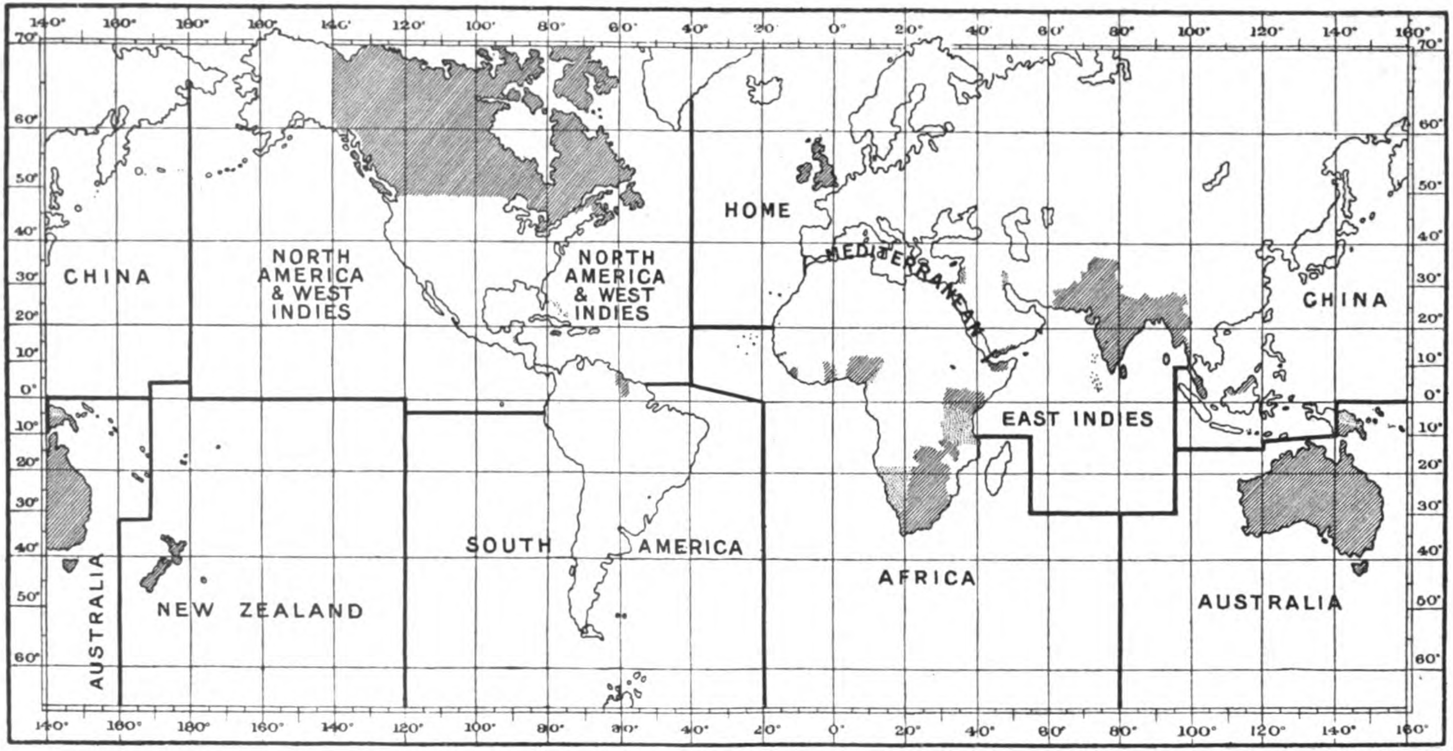
> The consideration by the Sub-Committee of the evidence, like the consideration by other authorities on previous occasions, has led them to a conclusion—a unanimous conclusion—in favour of the principle of a single Air Service. The Admiralty were rightly concerned to maintain the absolute control over all the fighting equipment in the Fleet which is essential to its efficiency. They also urged that reconnaissance at sea requires the technical training of a naval officer. The Special Sub-Committee, while unable to meet the views of the Admiralty to the extent of destroying the principle of a single Air Service, consider that they have dealt by suitable provisions with these detailed objections, and, in particular, have secured for them the absolute control afloat and the professional reconnaissance to which I have referred.
>
> The reasons in favour of a single Air Service which have had weight with the Government may be summarised as follow: In the first place, the Air Service, though it must have intimate relations with the other Armed Forces at sea and on land, and must be familiar with their requirements, differs in its conditions essentially from both. On the other hand, aircraft, whether they are flying above the sea or elsewhere, are, broadly speaking, governed according to the same main principles. In the second place, the whole science of air power is in a condition of rapid development. The application, therefore, of experience, both as to personnel and as to material, wherever that experience can be obtained, whether at sea or on shore, is vital to success in either case. We cannot afford to break up the lessons of this experience. In the third place, it is clear that, in certain contingencies, the shore-based air forces and the air forces of the Fleet may be called upon to act together. Such common action may be very difficult without a unity of method in both Services.
>
> Efficiency, therefore, prescribes common knowledge, common training, common material provision, and a common service. Economy points in the same direction. From this last point of view, the conclusion against this duplication of training schools and aerodromes and building plant is evident. For these reasons, the conclusion of the Sub-Committee and of the main Committee that there should be a single Air Service must, in the opinion of the Government, be accepted, subject to the conditions which are necessary to meet the detailed objections urged by the Admiralty.
>
> The recommendations of the Sub-Committee for this purpose are contained under

thirteen heads, dealing with liaison between the two Services, provision of material, inclusion in Naval Estimates of the charge for the Fleet Air Arm, integrity of the strength of the Fleet Air Arm, discipline and status of air officers and men when afloat, number and position of attached naval officers, and special reservation of air reconnaissances and spotting to the Navy. To these the main Committee have added a further recommendation, permitting to attached naval officers the retention of their uniform, a point which was strongly urged on behalf of the Admiralty.

Thus the question, at the time this chapter was written (September) was not decided with certainty, and it was understood that it would be discussed again when the final report of the Committee of Imperial Defence, dealing with other questions concerning national and Imperial defence, was presented in the autumn. As the Prime Minister admitted, "it is impossible without experience to pronounce a final judgment on these arrangements," but the Government relied on both Services to do their utmost to make them successful. As far as the Navy is concerned, such a request was unnecessary. Without the forbearance, and goodwill, shown in the past, the system in the naval air units would not have worked at all. The Admiralty have the whole of the experience of the war in their favour. As Lord Rothermere, the first Air Minister, and now a strong advocate of the Navy regaining control of its own air arm, stated in an article on the subject, "the naval air work in the war was done almost exclusively by airmen trained in the Royal Naval Air Service. To-day the Navy is offered airmen trained by the Royal Air Force by Army methods. During the last three or four years, the Air Force has been modelled upon the Army, not always very wisely. Every one knows that the Navy and the Army work under entirely different conditions. Naval airmen should be navally trained."

Fleet Distribution.

Important developments are evidently pending in regard to the distribution of the Fleet, following on the settlement of the Near East question. In February 1923, Mr. Amery wrote in his Memorandum that the temporary strengthening of the Fleet in the Mediterranean might become desirable as a permanent measure, to meet the general strategic situation. Though the need for this had passed by the autumn, the distribution of the Navy in other parts of the world called for revision. In South America, for instance, the withdrawal of the Squadron in the spring of 1921, as the First Lord pointed out, has undoubtedly been detrimental to our general interests in those waters. The "earnest hope" expressed by the Admiralty that it will be possible to revive this Squadron, or to arrange for frequent visits to South America, similar, it may be presumed, to those made by battle-cruisers and armoured cruisers before the war, is scarcely likely to have a more opportune moment for its realisation than at present. Officers and men will welcome the chance of more foreign cruising than they have been accustomed to since the rise of the German menace. The value of it is nowhere demonstrated more clearly than by the United States naval authorities, who during the latter months of 1923 sent most of their new vessels for long voyages abroad. The battleship Colorado was



Malby & Sons, Lith

CHART SHOWING LIMITS OF BRITISH NAVAL STATIONS.

(The British Empire is shown by ruling and the Mandatory Territory of the British Empire by stippling.)

to visit European ports, while the new light cruisers were sent, the Richmond to Ascension, St. Helena, and West Africa; the Detroit to Villefranche, Naples and Cartagena; the Milwaukee to Samoa and Australian ports; the Concord to South Africa; and the Cincinnati to the South Pacific islands.

Naval Staff Changes.

The only event of importance concerning the development of staff work at the Admiralty during the year was the disappearance of the Local Defence Division. Started in 1917 as the Anti-Submarine Division, this branch was renamed in July 1919, when it became concerned with the defence of harbours and bases, patrol and minesweeping forces, the protection of fishing fleets, instructions for entry into defended ports, mine warnings, and defence schemes generally. No money was appropriated for it in the Navy Estimates of 1923–24, but provision was made therein for two more commanders to be borne in the Plans and Operations Divisions, to which the work of the Local Defence Division has been transferred. The change is obviously a measure of economy, but the movement in this direction will need careful watching. The duties of the Department, which was a war creation, were only lessened, and not wiped out, by the coming of peace, and although they have been absorbed by other branches it is by no means assured that this is in all respects a good move, even though it lessens the number of officers employed at the Admiralty.

It should be pointed out that the increased cost of the Admiralty Office compared with pre-war years is not caused largely by the greater number of officers employed there. The Admiralty vote for the present year is £1,280,400, as compared with £483,500 in 1914. Even in the full war years, up to 1917, the office cost less than now, the cost in 1915–16 being £851,066 and in 1916–17, £1,024,108. The reasons for this are:—(1) It is only since the years 1916–17 that the war bonus has been granted to provide for the increased cost of living. (2) The large numbers of naval officers serving at the Admiralty during the war were provided for under Vote 1 (Wages) and were not shown under the cost of the Admiralty Office. (3) Increased scales of pay have been granted to both the naval and civil staffs in common with the whole naval and civil Services. (4) Abnormally long hours were worked by the staff during war years, which are impossible under normal conditions. (5) Extra staffs are needed for the liquidation of war work, the issue of prize money and medals, and generally owing to the greater attention paid to welfare questions. Hence in the pursuit of economy, so desirable in itself, it is well that effort should be directed to other points than the Naval Staff, upon the adequacy and efficiency of which the future of the Fleet so much depends.

Systems of Commissioning.

The distribution of the Fleet remains as last year, and the only change to note in the organisation of the various units is in the

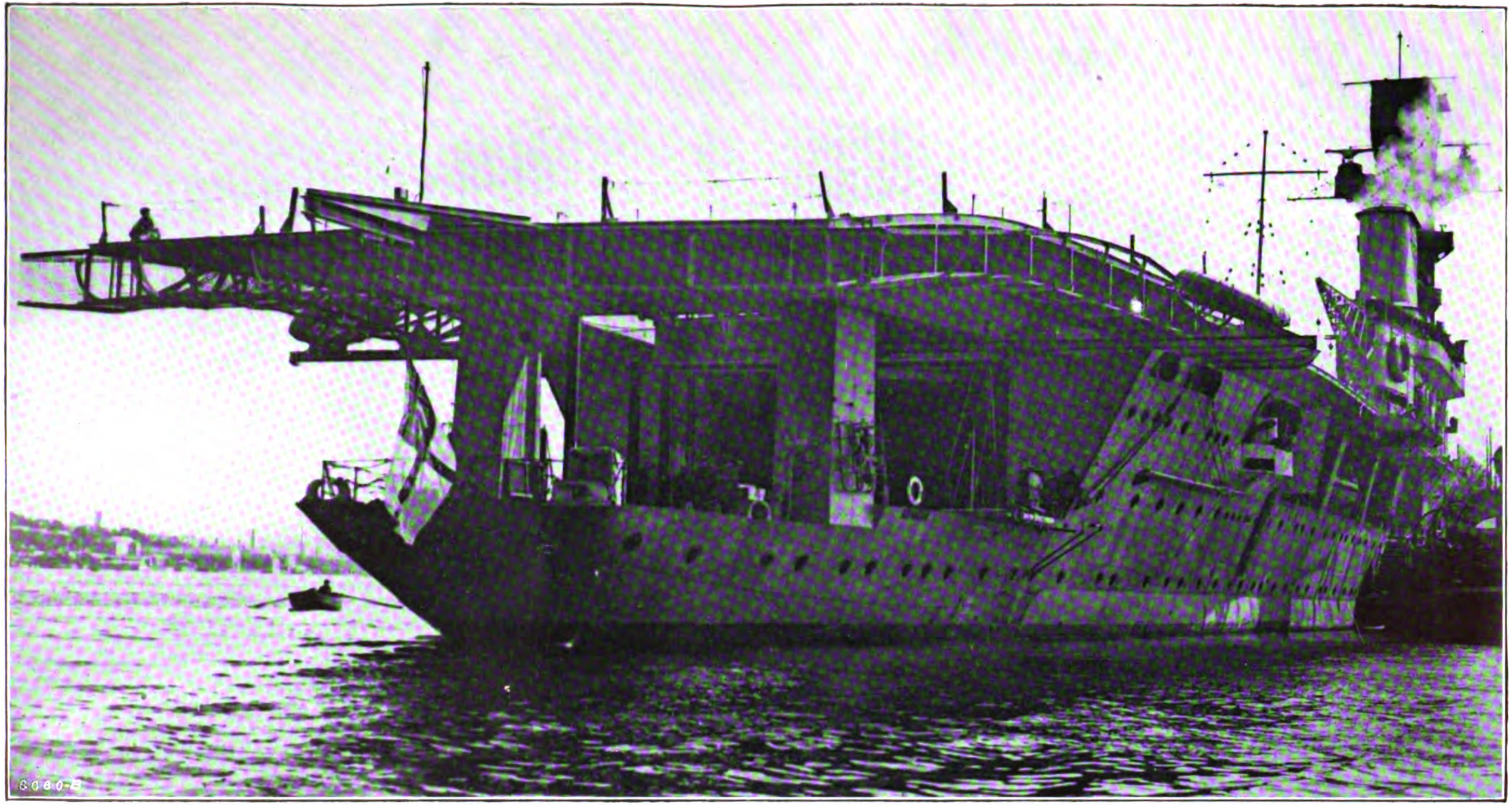
Mediterranean destroyers. Known as the Seventh Flotilla up to November 1922, and consisting of two leaders and sixteen destroyers, this force was then divided into two flotillas, each composed of one leader and eight destroyers, and known as the Seventh and Eighth Flotillas. This re-arrangement, which facilitates administrative work, brought the Mediterranean Fleet into line with the Atlantic Fleet in this respect. The Seventh and Eighth Flotillas have since been withdrawn from the Mediterranean and replaced by the larger and more powerful destroyers of the Third and Fourth Flotillas.

The system of commissions for ships at home appears to be in an unsettled condition. As recorded in the "Annual" 1921–22, continuous commissions, with one-sixth of the crew exchanged every four months, came into force at the beginning of 1921. After two years' experience, however, orders for the recommissioning of certain ships in the Atlantic Fleet were issued. The Dragon, for instance, paid off and recommissioned at Chatham on May 8, with a new Chatham crew for further service in the First Light Cruiser Squadron. This vessel had not been recommissioned since she first hoisted the pennant on August 10, 1918. The actual decision of the Admiralty on the subject was not made public, but it was evident that the continuous service arrangement had been abandoned, and that ships at home had been brought into line with those on foreign stations, where the normal length of commissions was already fixed at two and a half years. Depôt-ships in the Atlantic Fleet, however, were in March 1923, ordered not to be recommissioned, but to exchange one-third of their crews annually. The vessels affected by this rule were the destroyer depôt-ships Greenwich and Sandhurst, the repair ship Assistance, the submarine depôt-ships Cyclops and Lucia, and the submarine tenders Adamant and Alecto.

It was significant that this departure from the continuous commission plan should be made at a moment when there was no shortage of men, following as it did upon the reductions under the retrenchment scheme. The change appeared to indicate that the Atlantic Fleet will be less of a training force in future, for one of the advantages of the continuous commissions—revived at a time when there was a shortage of men—was that they allowed of parties of untrained ratings being passed through the seagoing ships. With the return to more normal conditions, it may be expected that this initial training on board ship will be chiefly carried out in vessels of the Reserve Fleet.

THE RELIEF OF SHIPS.

Constant changes have been made during the last forty or fifty years in the methods of relieving ships. Originally, a vessel on a particular station was relieved by the ship which succeeded her, and she then returned home to pay off. If there was no need to recall the ship, her crew remained on the station, and thus commissions ran sometimes into five, six, or seven years. Then the practice arose of reliefs being conveyed in merchant vessels to ships abroad, where recommissionings took place, the paid-off crews also returning by freight steamer. Another change was the use of men-of-war for



(*Photo: Abrahams & Sons, Devonport.*)

THE LATEST TYPE OF AIRCRAFT CARRIER FOR THE BRITISH NAVY: H.M.S. HERMES (STERN VIEW).

(*Constructed by Messrs. Armstrong, Whitworth & Co., Ltd., Walker on Tyne.*)
(*For particulars see p. 428.*)

such transport duties, which was defended on the ground that such vessels while on passage constituted additions to the strength of any station through which they might pass. Then came the recall of most of the squadrons abroad, the establishment of the nucleus crew system, and the adoption of two-year commissions. Certain disadvantages of the last-named, described by Mr. Churchill in his first speech when introducing the Navy Estimates (see the "Annual" of 1912, pp. 431–2), led to the decision to adopt the continuous commission system for ships at home, but it had not been put into force when war came and necessitated its postponement. Now that the post-war Fleet may be said to have been evolved, and the foreign squadrons have been revived, the question would seem to be still uncertain, for while new crews are being sent out to some ships, others are returning home to recommission, and there appears to be a tendency to adopt different practices for different types of ships at home.

NAVAL RESERVES.

Good progress has been made during the past year in establishing the various reserves of the Navy on a sound basis after the war. An increasing number of officers of the Royal Naval Reserve have been appointed from time to time for various technical courses at the ports, and two captains, R.N.R., were, in October 1922, appointed to the Senior Officers' War Course at Greenwich. The quarterly returns of signalling exercises between warships and merchant vessels show a great advance in the proficiency of the latter in the various methods of communication.

Modifications in the regulations regarding the drill of the Royal Fleet Reserve have also been instituted. The men of Class (A)—*i.e.* life pensioners—perform one week's drill during the calendar year following the year of enrolment, and one week's drill during each alternate calendar year thereafter. Men in Class (B), or non-pensioners, perform one week's drill in each calendar year subsequent to their enrolment. The Immediate Class, R.F.R., which played a useful part in the prompt mobilisation of the Fleet in July 1914, has lapsed during the past year. Although, at present, no urgent necessity exists for nucleus crews, and for the Immediate Reserve, both these systems have proved their value, and it may become expedient to introduce them again.

The bringing up to date of the facilities at the Divisions of the Royal Naval Volunteer Reserve was continued by the allocation of new drillships to most of them. Following the arrival in the Thames of the new President (ex-Saxifrage) for use by the London Division, the monitor M. 23, renamed Claverhouse, was taken to Leith for use by the Scottish Division; and the sloop Sir Bevis, renamed the Irwell, to the Manchester Ship Canal as drillship for the Manchester sub-divisions of the Mersey Division. The sloop Flying Fox has been allocated, when completed, to the Bristol Division. Gradually the new ranks instituted in the post-war scheme of organisation for the R.N.R. and R.N.V.R. are being taken up. On May 15, 1923, the Admiralty announced the appointment of the first Engineer-

Captain, R.N.R., when Chief Engineer W. J. W. Bruce, O.B.E., retired, Superintendent Engineer of the White Star Line since 1904, was granted an honorary commission in this rank, to date May 11.

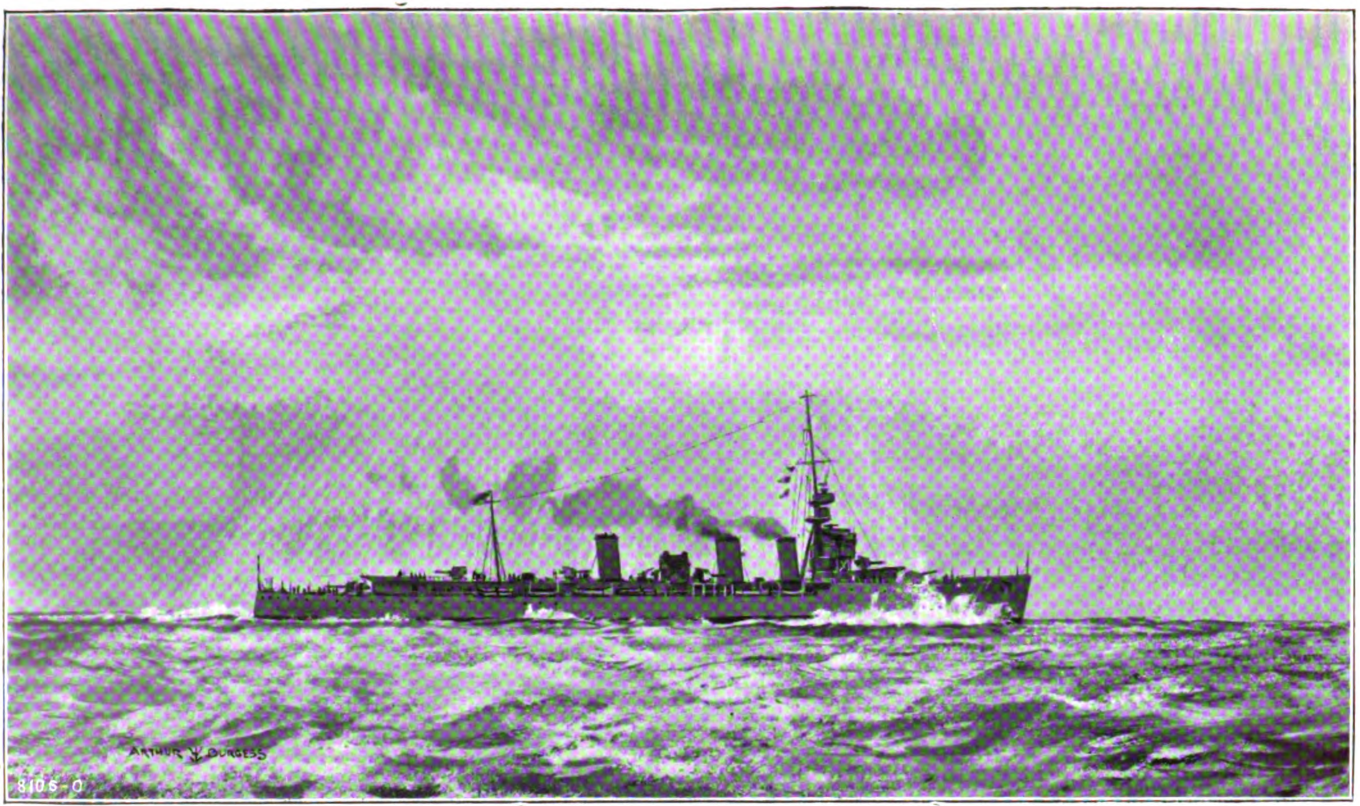
Following the visit to Belfast of the First Battle Squadron in May 1923, it was announced that the Government of Northern Ireland was to form a new Division of the R.N.V.R. with a strength of 500 officers and men. The project was taken up with keenness by yachtsmen and others in Ulster, and Captain R. F. H. Hartland-Mahon, R.N., retired, was appointed to organise the new Division, for which, in September, the ex-light cruiser Caroline was appropriated for duty as drillship.

A new departure since the war is the Special Reserve of Engineer Officers, R.N., established in 1920, in regard to which complete regulations for organisation and administration were issued by the Admiralty on March 2, 1923. This reserve is composed of officers who held temporary commissions and warrants in the Royal Navy during hostilities. Coupled with the greater scope for engineer officers in the R.N.R. and R.N.V.R., it indicates that the Board have taken steps to ensure that there shall be no deficiency of officers in charge of the machinery of our warships in the event of a mobilisation.

ROYAL MARINE CHANGES.

On March 28, 1923, the Financial Secretary to the Admiralty made in the House of Commons the first authoritative statement concerning changes in the Royal Marines, involving the amalgamation of the R. M. Artillery and Light Infantry. It was necessary to reduce the number of Royal Marine Divisions in view of the numbers in the Corps having fallen to under 10,000 as against 18,000 in the years before the war, and this has been done by abolishing the Light Infantry headquarters at Gosport, and uniting its personnel with the R.M.A. at Eastney, the surplus officers and men in equal proportions from both forces being transferred voluntarily, as far as possible, to Chatham and Plymouth to equalise the numbers at the three home ports. The absorption of what used to be the "Blue" Marines caused considerable regret on sentimental grounds. As the First Lord explained, however, the change had a great many advantages both in economy and efficiency. One was that foreign service would be equally shared, the new scheme enabling each capital ship to be manned from its own port. There is now one recruiting depôt at Deal, a specialised land gunnery school at Eastney, and three divisions at the home ports. The new dress of the Royal Marines is a blue tunic with red facings, but present officers of the R.M.L.I. are allowed to retain their red mess dress and those of the R.M.A. their blue mess dress. While there was considerable criticism of the policy of merging the two branches into one Corps under the historic title of "Royal Marines," the concensus of opinion in the Sea Service appeared to be in favour of the change, which was regarded as inevitable in the circumstances, and, in any case, long overdue.

Pruned in one direction, the Royal Marines have blossomed in another; the "Royal Marine Police" have been established to replace



(From a drawing by Arthur J. W. Burgess.)

H.M. LIGHT CRUISER EMERALD.

(Constructed by Messrs. Armstrong, Whitworth & Co., Ltd., Walker-on-Tyne.)
(For particulars see pp. 428 and 488.)

the Metropolitan Police employed at Royal Navy armament depôts and magazines and other establishments where the services of the London policemen were not required in the ordinary course for the prevention of crime. Administered by the Adjutant-General, R.M., and attached for record, pay, clothing and discipline to the several Royal Marine Divisions, the relation of the new force to the Admirals-Superintendent and the officers in charge of depôts is the same as that formerly existing for the Metropolitan Police. Retired officers, R.M., have been appointed to commissions in the new force, the strength of which was fixed in the Estimates at 7 commissioned officers, 1 warrant officer, and 273 non-commissioned officers and men.

THE COASTGUARD REORGANISED.

Another branch of the Naval Service which has undergone considerable change during the past year is the Coastguard. The report of the Treasury Committee on this force was summarised in the last issue of the "Annual." It gave rise to considerable discussion in Parliament and elsewhere. The main objections to the new system were that it would make for divided control, and that it ought to be easy for the three departments mainly concerned—the Admiralty, Board of Trade, and Customs and Excise—to make appropriate contributions towards the cost of the Navy Votes; that the suggested saving was quite problematical, and likely to prove costly if it resulted in added danger to life and property; that members of the new force, being civilians, would be entitled to join trade unions, and instead of working, in emergencies, 24 hours at a stretch, would only work 8 hours and then claim overtime; and that it was unwise to withdraw the prospect of service in the Force from the older seamen and at the same time take in men with less knowledge and experience.

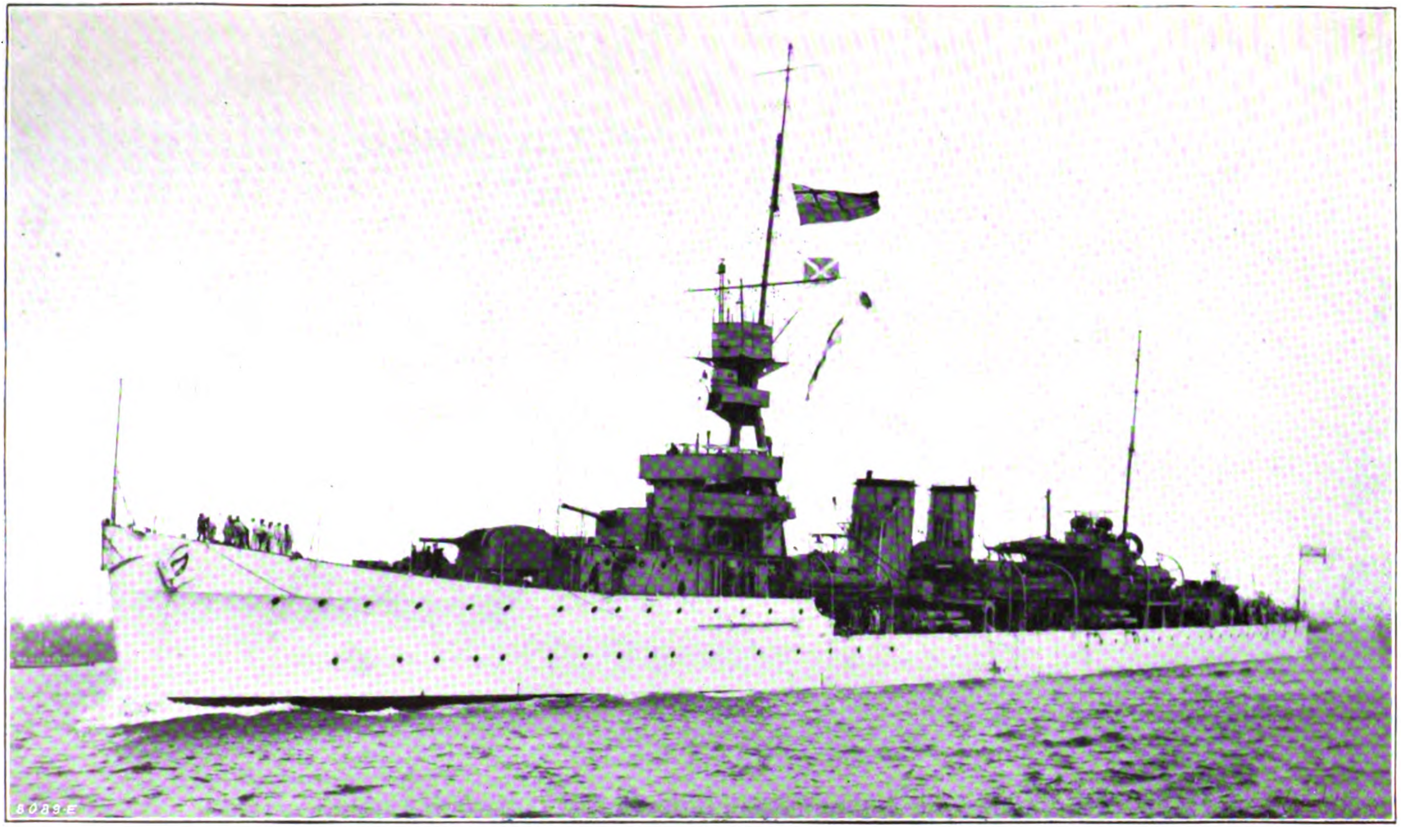
The official case was presented with care and thoroughness. Unity of control in war was safeguarded by the provision that the Admiralty is to take over the entire force on mobilisation. In peace, the Admiralty requires for naval purposes only a handful of officers and men to work the wireless stations and Lloyds' signal stations; the extraneous duties of coast-watching, life-saving, salvage and foreshore administration can be better discharged by the Board of Trade, with an extended scheme of co-operation with the Royal National Lifeboat Institution and similar civilian bodies; and the work of revenue protection, which loomed so large when the Admiralty took over the Coastguard in 1856, can now be done chiefly by the Customs officers at the great seaports. The amount of money saved can only be determined by experience, and in this and other respects, the new system is admittedly on its trial. But the new Coastguard Force under the Board of Trade, of which Captain J. D. Daintree, C.B.E., R.N., was appointed Inspector-General, and which is staffed by naval officers and men with Coastguard experience under the Admiralty, is out to provide a life-saving service around Great Britain of a standard in keeping with our maritime position, to which end over 4,000 persons are enrolled in volunteer corps and life-saving brigades.

As to the status of the Board of Trade Coastguard, it was affirmed that this will be determined by legislation, but the assumption is that its officers and men will be in a position analogous to that of the Police, who are not allowed to join trade unions. As an avenue of employment for naval men, the Coastguard had already been much reduced in strength, and moreover, it was often urged against the older men, who joined it to end their careers, that they would not learn, considering they already knew sufficient. The new Force, taking in younger men, can put them through a period of instruction in the duties required of them on the coast, such as the former Coastguard made no provision for, as each new entrant went direct to a station. It may be conceded that due regard should be had to the great difference in the conditions obtaining to-day and those in 1856, in formulating a judgment upon the policy of the Admiralty in this respect. Then, the Coastguard was looked upon as a reserve for the Navy. The late war emphasised the fact that it no longer fulfills this *rôle*, for three reasons; firstly, the men are, in large measure, untrained to the needs of a modern Fleet; secondly, when hostilities begin they are more than ever needed on the coast instead of at sea; and thirdly, there are now other and more suitable reserves in existence in the Royal Naval Reserve, Royal Fleet Reserve, and Royal Naval Volunteer Reserve.

THE NEW CAPITAL SHIPS.

Details of the contracts for the two capital ships allowed to Great Britain under the Washington Treaty, and authorised in the Navy Estimates of 1922–23, were published on December 12, 1922, and the keels of the ships were laid a few days later. Announcement that the names of Nelson and Rodney had been chosen for them was made on January 23, 1923. The Nelson is being built on the Tyne by Messrs. Armstrong, Whitworth and Co., with engines and boilers provided by the Wallsend Slipway and Engineering Co. The Rodney is being built on the Mersey by Messrs. Cammell Laird and Co., who will also construct the machinery. Glasgow tenders were very much higher than those of the successful firms, and thus the Clyde, which had secured three hulls and two sets of engines out of the four battleship orders placed in 1921 and cancelled after the Washington Conference, was disappointed in not obtaining so much work as was expected. Glasgow, however, benefits considerably by the orders for materials, especially guns and armour.

There is no longer that need for strict secrecy about the details of new ships which prevailed during the period immediately before the war, and it may be hoped the authorities will recognise this and abandon the policy of concealment which marked the building of the Dreadnought fleet. Then secrecy was desirable in order to baffle the Germans, and was justified by its success, as witness the design of the Blücher in comparison with that of the Invincibles. Now, however, there is no such competitive building, for the British capital ships are the only ones under construction in any country, and none can be laid down for ten or more years, and definite



(*Photo: Stephen Cribb, Southsea.*)

H.M. LIGHT CRUISER DIOMEDE.

(*Constructed by Messrs. Vickers, Ltd., Barrow-in-Furness.*)
(*For particulars see pp.* 427 *and* 490.)

limits in regard to the important elements of displacement tonnage and the calibre of the heavy armament are fixed by the Washington Treaty. The ships, that is to say, must not exceed 35,000 tons, nor carry bigger guns than 16-in. Unofficially, it has been stated that they will carry nine 16-in. weapons, in three triple turrets; that they will be 680 ft. long and 106-ft. broad, and that the anti-torpedo bulge will be fitted, as it were, inside instead of outside the hulls.

The construction of these two battleships being essential in order to make up the relative strength of the British Fleet to the ratio of 5—5—3 as compared with America and Japan, agreed upon at the Conference, it is a matter for regret that their building should have been retarded by labour difficulties. On May 2, 1923, the Financial Secretary to the Admiralty said that only 109 workpeople were employed on the Tyne ship, the number being affected by the lock-out of the members of the United Society of Boilermakers and Iron and Steel Shipbuilders, as work on the steel structure of the vessel was at a standstill.

Light Cruisers and Other Craft.

Battleship construction having been stereotyped, as it were, for some years ahead under the Washington Treaty, the question of cruiser building assumes relatively larger importance. In this connection, a change in classification is obviously overdue; for to group the two British ships of the Enterprise type, the three of the Hawkins class, the ten Omahas in the United States, and the larger new Japanese vessels as "light" cruisers, in the same class as the early "C" type and others of about one-third the size, is misleading. The light cruisers have developed to such an extent as to exceed in size, as they do considerably in power, the "cruisers" of an earlier day, formerly described as armoured cruisers or protected cruisers.

As regards the Effingham and Frobisher, of the ocean-going commerce-protecting type of light cruiser, designed in 1915, the former is still uncompleted, although the Frobisher was ordered to be finished by the end of 1923, and will be a useful addition to the Fleet in place of the lost Raleigh. The Enterprise and Emerald, smaller and faster vessels, with a 6-in. instead of a 7·5-in. gun armament, remain over until 1924-25. These are the only light cruisers remaining over from the war programmes. No new vessel of this kind has been put in hand since 1918, and a review of foreign progress in this connection indicates that the time cannot be far distant when British light cruiser construction must be resumed, in order to anticipate the large proportion of wastage which will occur by so many vessels built during the war becoming obsolete together. In every country but Great Britain, steps have been taken to provide new light cruisers of post-war design.

The flotilla leaders Keppel and Rooke, laid down by Messrs. Thornycroft & Co. in the autumn of 1918, are to be ready for service by April 1924, as are the destroyers Shikari, Whitehall and Witch, constructed by Messrs. Doxford and Sons, Messrs. Swan Hunter and Wigham Richardson, and Messrs. Thornycroft, respectively. This will wipe off the last of the arrears of war programmes so far as surface-torpedo craft are concerned. Two submarines, however, L.26 and L.27, laid down in January 1918, by Messrs. Vickers, Ltd., will remain over for completion in the financial year 1924–25.

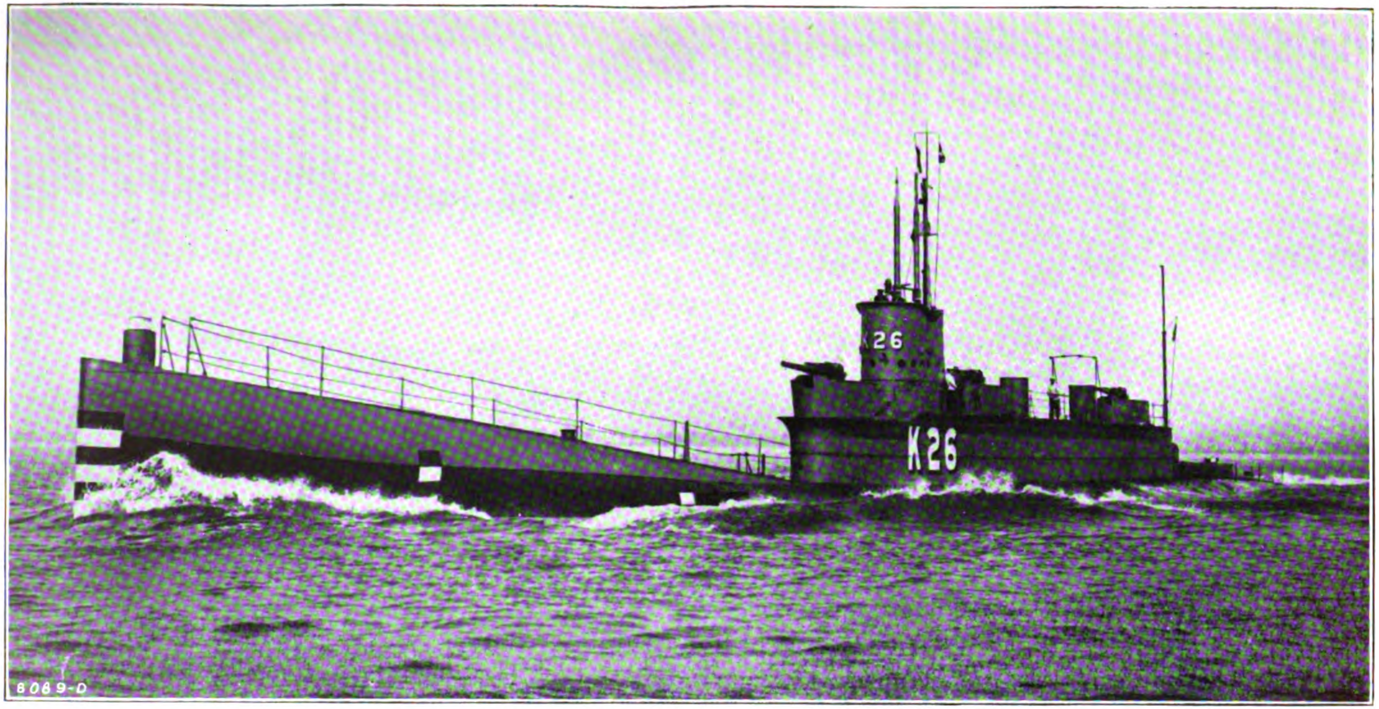
NEW SUBMARINES.

One of the most interesting vessels in the dockyards at the present time is submarine X.1, which was laid down at Chatham in November 1921, and launched by Mrs. Kiddle, wife of the Admiral-Superintendent, on June 16, 1923. Both hull and machinery are being constructed at Chatham, which has now produced twenty-five under-water craft altogether, beginning with C.17 and C.18 in 1908. The X.1, however, is by far the largest vessel of her kind built in any yard. She has a displacement on the surface of 2,780 tons, and submerged of 3,600 tons. Next to her in point of size comes K. 26, launched in 1919, and commissioned at Chatham on May 19, 1923, which is of 2,140 tons and 2,770 tons, respectively, or more than 200 tons heavier than her predecessors of the steam-driven "K" class. The largest American submarines of which information is available are the "fleet submarines" V.1, V.2, and V3, which are to be completed during 1924. They displace 2,114 tons on and 2,520 tons below the water. The 3,600 tons of X. 1 is stated to be 1,400 tons greater than that of the largest German submarine, U. 142. She is understood to have been designed to develop a speed enabling her to work with the battle fleet, and to have a cruising radius of 6,000 miles, or somewhat more than that of the American "V" type, which are to be able to travel something over 5,000 miles. No authentic details of her armament have been published.

CRUISER-MINELAYER AND AIRCRAFT CARRIERS.

The historic name of Adventure, which dates back to 1594, when it was given to a vessel of 343 tons built at Deptford, has been selected for the new minelayer laid down at Devonport Dockyard in November 1922 and mentioned in the last issue of the "Annual." In the official Return of Fleets of the Principal Powers issued in May 1923, this vessel was listed in a new category of "cruiser minelayers," and is at present the sole representative of the type. All other British minelaying ships have been adapted from other duties.

Progress in regard to aircraft carriers continues to be slow, but the past year has been memorable for the completion of the Hermes at Devonport, in July—the first vessel of this nature to be specially designed and built for the duty, all the rest having been converted from other purposes. The Eagle (formerly the Chilean battleship Almirante Cochrane) is undergoing alterations at Portsmouth, and the Furious, ex-light battle-cruiser, similar reconstruction at Devonport. During the past year, therefore, the Argus, originally begun as an Italian merchant ship, has been the only aircraft carrier in service with the Atlantic Fleet. A later chapter deals specially with the subject of aircraft carriers.



(Photo: Stephen Cribb, Southsea.)

H.M. SUBMARINE K 26.

(*Constructed by Messrs. Vickers, Ltd., Barrow-in-Furness.*)
For particulars see p. 467.)

RECONDITIONING SHIPS.

In the programme of repairs and alterations to ships included in the current Navy Estimates, the item which appears to have attracted most criticism was the allocation of the large sum of £119,218 to the light cruiser Weymouth. This obsolete vessel, completed in 1911, is being overhauled because of the necessity of retaining a coal-burning ship in an efficient condition ready for service abroad, but the need for this is tantamount to an admission that the oil-fuel storage plans of the Government have not kept pace with the progress of oil-fuel ships. The Weymouth is manifestly outclassed as a fighting unit by later types built during the war, and to be obliged to spend money on keeping her efficient is to burden the Fleet with the sort of ship which experience has shown is likely to be useless in war time.

Among other duties for which the war-time sloops are proving useful in the post-war Navy is that of surveying ships. The Ormonde and Merry Hampton, of the "race-horse" type, colloquially known in the service as "the Derby string," have been taken up and are fitting out at Devonport for the hydrographic department, the Ormonde to replace the Mutine and the Merry Hampton to replace the Fantome. The Merry Hampton has been renamed the Herald, which brings back into use a name associated with a number of valuable undertakings by officers and men of the surveying branch. The second Herald, in the 'forties of the last century, was commanded by Captain Henry Kellett, C.B., after whom another of the post-war surveying vessels is named.

OLD SHIPS REMOVED.

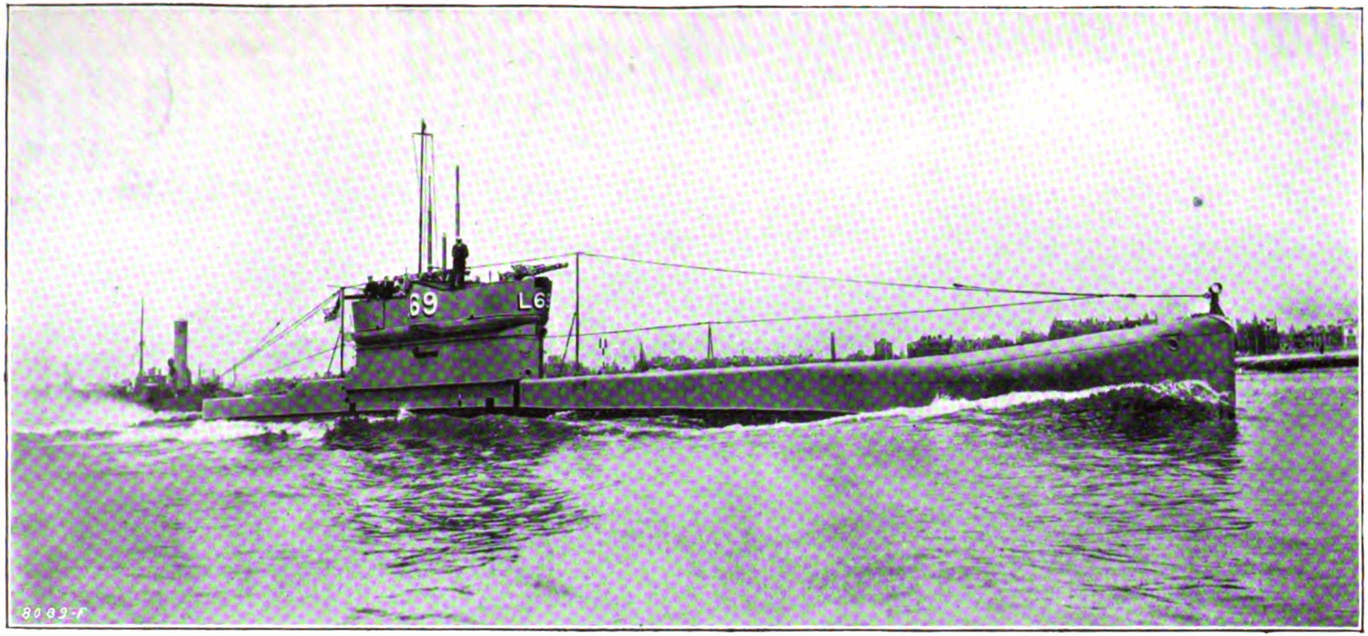
The drastic reductions in the material of the Navy during 1922 left comparatively little to be done in this respect in 1923. The delay on the part of the other Powers in ratifying the Washington Treaty gave rise to certain misgivings as to whether the British Government had not gone too far in scrapping so many vessels. It was not until July 8, 1923, that the Treaty was ratified by the French Chamber of Deputies. A week later, Mr. Denby, the United States Naval Secretary, called a meeting of officers and appointed two boards, one to consider methods of scrapping, and the other to take up the cancellation of contracts for vessels under construction which are not to be completed. Long before this, however, the British Admiralty had scrapped all the ships specified by the Treaty, except the Lion, which had been temporarily retained in order that certain fittings might be taken out of her as souvenirs in view of her specially distinguished service in the North Sea throughout the war. On April 25, 1923, Mr. Amery stated in Parliament that the number of capital ships scrapped by the three principal naval Powers was: Great Britain, 17; United States, 2 being broken up, 5 dismantled preparatory to sale; Japan, 5 with main armament removed, 8 paid off.

A comparison of the Navy Lists of July 1923 and July 1922, shows that the following vessels were removed during the twelve months: Battleships—Agincourt, Erin, Conqueror, Orion, Neptune, Collingwood, Superb, Commonwealth, and Crescent (late Glory); battle-cruisers—Princess Royal and New Zealand; cruisers—Antrim and Gibraltar; light cruisers—Royalist, Inconstant, Undaunted, Boadicea, Pioneer, Glasgow, Naiad, and Philomel; 35 sloops; and numerous torpedo craft, surface and submerged. The difference in our procedure from that of other Powers was that, whereas the British ships named in the Washington Treaty were dismantled and rendered unfit for further service, although in certain cases they could not be immediately sold because of the market being flooded with scrapped vessels, those of other Powers were only paid off and laid up until the coming into force of the Treaty, which took place on August 16, 1923, when the formal exchange of ratifications of the five Powers took place in Washington. The moral effect of the British reductions, however, has not, it is to be hoped, been lost upon the world, as an evidence of our sincerity in desiring to reduce armaments to the barest minimum.

DOCKYARD CHANGES.

The changes in the Royal Dockyards during the past year included the transfer of Haulbowline Dockyard to the Irish Free State. This took place on March 31, 1923. Three months later, the Government of the Free State announced that they were prepared to consider offers for the lease of this yard. The naval bases at Kingstown and Queenstown were also closed, as was the dockyard at Wei-Hai-Wei. Similarly, Ascension Island, which for over a hundred years had been administered by the Admiralty, practically as if it had been one of H.M. ships, was transferred to the Colonial Office, and the Royal Marine garrison was withdrawn. There were some amusing questions in Parliament as to whether the annual gifts of green turtle from this island would still be made to the Admiralty under the new administration, and whether the custom that one turtle was presented to the captain of the ship bringing them, and the legend that, whatever happened to the rest, the captain's turtle never died, would be perpetuated.

Mention may be made here of the steps now being taken in Portsmouth Dockyard to preserve and restore the Victory. It having been decided that public funds could not be devoted under present conditions even to so worthy an object, the Society for Nautical Research, with the approval and support of the Admiralty, has undertaken to raise money to carry out this work, and Admiral of the Fleet Sir Doveton Sturdee, President of the Society, is energetically leading the campaign. Work on the vessel was formally begun on June 1, the anniversary of Lord Howe's victory of the Glorious First, and his descendant, Earl Howe, was invited to inaugurate the restoration at Portsmouth by lowering a carving representative of a cherub from the figurehead of the ship. At the annual meeting of the Society later in the month, Sir Doveton Sturdee said that £69,000 had been subscribed, but he wanted £80,000 by the end of the year if the work was to continue. Reports



(*Photo: Stephen Cribb, Southsea.*)

H.M. SUBMARINE L 69.

(*Constructed by Messrs. William Beardmore & Co., Ltd., Dalmuir.*)
(*For particulars see p. 467.*)

of the technical sub-commitee, of which Sir Philip Watts is the Chairman, may be read in the Society's journal, the *Mariner's Mirror*. It is much to be hoped that the required sum, £150,000, will be speedily forthcoming to place the question of the restoration of this priceless relic of the greatest days of our sea power beyond doubt.

THE NAVAL CAREER.

Turning now to the progress of the past year in regard to the personnel, there is to be noted a decided reluctance, as compared with pre-war days, on the part of parents or guardians to put their boys into the Navy as officers, due to a feeling, which is quite erroneous, that as a profession it does not offer the same opportunities as formerly. The drastic post-war reductions and discharges have largely contributed to this feeling. Yet, as Vice-Admiral Sir Roger Keyes said in a speech at Cheltenham College, the boys who enter at such a time as the present have a great opportunity, because a reaction is bound to come later, as all history shows, and the post-war discharges would actually ensure the future of the new entries. During the past year, while there has been no difficulty in filling all the vacancies for cadetships in the executive ranks, the numbers of applications for nominations are understood to have fallen off, so that there is much less competition, which fact must make its influence felt on the general standard of those accepted. It would be a serious matter for the nation if there should arise an actual shortage of candidates for the officer ranks in its Fleet, and, in this connection, the policy of doubling the College fees at Dartmouth was indeed a short-sighted one, and an economy likely to be paid for dearly in the future. So also would be a drastic interference with the present rates of pay.

Changes have been brought into operation in regard to the training of midshipmen as a result of the lengthened technical courses which junior officers now undergo as acting sub-lieutenants, at Greenwich and elsewhere. The original plan, when the Selborne-Fisher system was inaugurated, was that midshipmen should serve for three years at sea, then pass their examinations for lieutenant, and then return for a further two years at sea as sub-lieutenant and lieutenant before being called upon to specialise. As far as engineering is concerned, officers have now to volunteer to specialise while still cadets, during their last term in the sea-going training ship, and those accepted go direct to the Royal Naval Engineering College at Keyham, on being rated midshipmen, for a four-years' course. Specialists for the other branches are chosen at about the same age as formerly, but the institution two years ago, as recorded in the last issue of the "Annual," of a six-months' shore course at Greenwich, followed by short courses in gunnery, torpedo, and pilotage at the schools at Portsmouth, necessitated an alteration of the former curriculum for midshipmen when at sea.

INSTRUCTION OF JUNIOR OFFICERS.

Instead of midshipmen, as was ordered when the first Osborne boys went to sea in 1908, working with the executive, gunnery, torpedo, and other specialist officers for continuous periods, to be available at all times when required by those officers, and "not to be employed on any ship's duties of a different character at times when they might be required by the specialist officers with whom they were working," the Admiralty now consider the primary object of midshipmen serving afloat should be to enable them to obtain experience in their duties as officers. Training based upon formal instruction is a secondary object. Midshipmen are now regarded as being an integral part of the ship's organisation. Boat work and special duties are to be shared among them all. They are to be given definite commands among the various divisions in the ship, and general quarters, divisional drill, in and out of harbour routine, and watch-keeping at sea are to take precedence over formal education. A good deal less time is necessarily devoted to engineering than was the case before the war. All midshipmen had then to spend about one-third of their time with the engineer officer; now they carry out only three months' engine-room training. Whereas they then worked through a full syllabus, including general principles of heat, steam, and combustion, types of main and auxiliary engines, and ship construction, now the aim is to provide a knowledge of the conditions obtaining in the machinery departments, of the organisation of the engine-room, and of the limitations to which the machinery is subject. "Detailed knowledge of machinery is not required," state the Admiralty.

The course which acting sub-lieutenants now undergo at Greenwich is by nature of being a substitute for, or a continuance of, that which was held for junior officers at Cambridge University from January 1919 to March 1923, and from which much benefit was derived by those who took part in it. In an order of March 23, 1923, the Admiralty directed that those officers who failed to reach the requisite standard were to resume their studies at the commencement of the next term for a further period of one term's instruction before proceeding to Portsmouth for their gunnery, torpedo, and navigation courses, and were to be re-examined at the end of this period. The first failure entails loss of two months' time, and a second failure renders the officer liable to discharge from the Service. Revised scales for accelerated promotion to lieutenant, issued in Fleet Orders on September 21, 1923, for officers promoted to acting sub-lieutenant on September 15 and subsequently, provided that for ten marks, promotion should take place 13 months from the date of seniority as sub-lieutenant; for nine marks, 15 months; eight marks, 17 months; seven marks, 19 months; six marks, 21 months; five marks, 24 months; four marks, 26 months; three marks, 28 months; two marks, 30 months; one mark, 33 months; and no marks, 36 months.

COURSES FOR OFFICERS.

The various courses for officers described in recent issues of the "Annual" all continue their work with little or no modification. For the War Staff Course, which opened at the Royal Naval Staff College, Greenwich, on September 24, 1923, it was approved that the maximum age for selection should be raised from 34 to 35. Two Dominion officers joined this course, Lieutenant G. C. Jones, R.C.N., formerly in command of the destroyer Patriot at Halifax, and Lieutenant H. B. Farncomb, R.A.N., formerly doing War Staff duty on the Staff of the Commodore Commanding the Australian Fleet. From twenty to twenty-four officers are now being taken annually for the Staff Course, or little more than half the total of forty per annum which was to be aimed at when the Staff College at Greenwich was opened in June 1919.

During 1923, the Senior Officers' Technical Course at Portsmouth was opened to commanders. For the term which began on April 9, six officers of this grade were selected, in addition to nine captains, R.N. Up to July 1922, a separate technical course had been held for commanders, but it was abolished on the ground of economy, and applications from officers of this rank to attend the Senior Officers' Technical Course are now considered, although the latter is intended primarily for captains prior to their assuming command afloat or taking a War Course at Greenwich. Another development in the Technical Course was the appointment of two officers of flag rank to the term which began on October 8—Rear-Admirals B. S. Thesiger, C.B., C.M.G., and P. M. R. Royds, C.M.G.—a revival of pre-war practice.

The Senior Officers' War Course at Greenwich no longer has a flag officer directly assigned to it. As from November 15, 1922, the duties of the Admiral President of the Royal Naval College, and of the Rear-Admiral of the Senior Officers' War Course, have been amalgamated under one flag officer, who has the title of "President and Flag Officer Commanding the Royal Naval College, Greenwich." Before the war, the War Course was held at Portsmouth, and while it makes for a small economy to have it at Greenwich and administered by the President of the College there, it seems a pity, and likely to detract from the importance of the Course, that it has no head of its own. As compared with the four captains, R.N., who carry on the instruction, there were, in 1914, a Vice-Admiral in Command, ten captains and commanders, and five other officers on the staff, including engineer and marine officers. Even allowing for the great drop in the number of those taking the War Course, the attention devoted to the study of war problems seems much less than could be wished.

On September 21, 1923, the Admiralty notified their decision to institute a new short course for senior engineer officers at the Royal Naval College, Greenwich, with a view to assisting such officers to keep their professional knowledge abreast of developments in engineering. This course, of about twelve weeks' duration, will be held annually during the midsummer term, and will be confined to twelve captains and commanders of the engineer branch, not more than four being of the former rank.

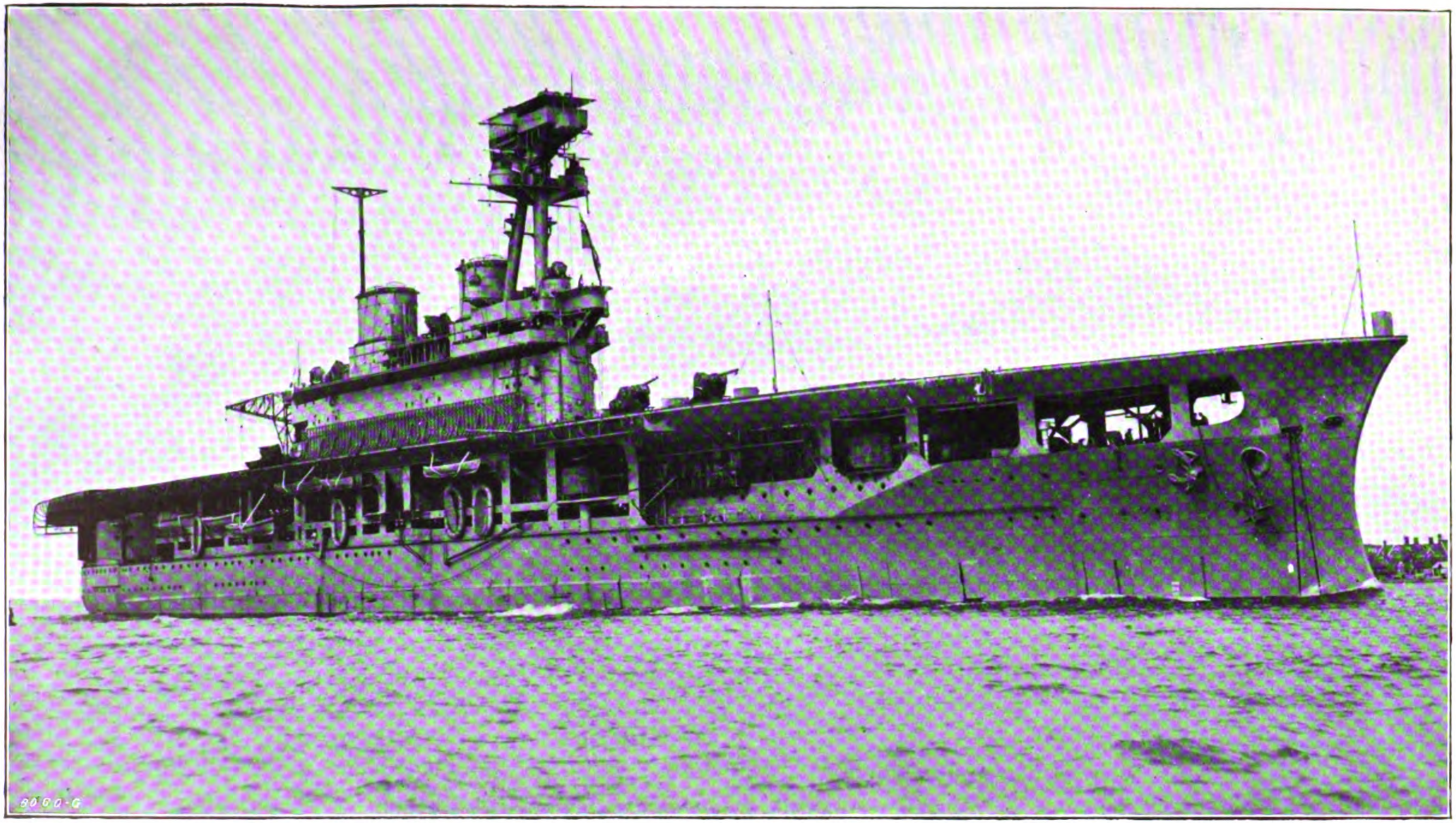
TRAINING IN C.M.B.'S.

In addition to the courses for the training of naval officers as air observers, referred to elsewhere, others of a technical nature have been instituted as a result of the experience of the war. A few officers are taken each year for service in coastal motor-boats. They must be under four years' seniority as lieutenant, have completed one year's service as lieutenant in a seagoing ship, and be recommended. Since the closing of the excellent coastal motor-boat base, built during the war at Osea Island, the headquarters of the branch have been in the Vernon at Portsmouth. About thirty boats remain on the list, including some allocated as targets. The future of this type of craft was discussed in a valuable paper read before the Institution of Naval Architects in the spring of 1923 by Sir John E. Thornycroft and Lieutenant W. K. Bremner, D.S.O., D.S.C., R.N., the latter of whom handled C.M.B.'s in action. It is true that the most successful seaplanes have now adopted a form of hull and construction very similar to the C.M.B.'s, but such a flying boat is more liable to damage owing to the size of its wings and to its structure and motor being more highly stressed. There should, therefore, as far as can be seen at present, be a field for both classes in naval warfare.

GYRO-COMPASS INSTRUCTION.

The growing importance of the gyro-compass in the navigation of the modern ship has also led to the institution of a course in this instrument at the Admiralty Compass Observatory at Langley, Bucks, for all officers who qualify in navigation for first-class ships. Those who have already received gyro instruction are to take refresher courses at intervals of every three years in order to keep abreast of the latest developments. Originally fixed at ten working days, the courses were ordered, at the end of July 1923, to be of two weeks' duration.

Mention may also be made here of the setting up of a Committee under the presidency of Rear-Admiral G. H. Baird, C.B., to investigate the provision and training of the subordinate electrical and torpedo personnel (including mining) of the future—an important matter in regard to which the experience of the war showed the need for changes. Similarly, it was decided, in February 1923, to introduce a special course in breech mechanisms for ordnance artificers passing for chief ordnance artificer, and for warrant ordnance officers, the course to comprise six weeks' special advanced instruction at Woolwich, followed by two weeks' instruction at Priddy's Hard under the Inspector of Naval Ordnance. Training for the Anti-Submarine Service has continued, 50 more volunteers being called for towards the end of 1922. In March 1923, the sloop Heather replaced the cruiser Gibraltar as depôt-ship of the Anti-Submarine Establishment at Portland.



(*Photo: Stephen Cribb, Southsea.*)

H.M. AIRCRAFT CARRIER EAGLE: BOW VIEW AFTER RECONSTRUCTION.

(*Constructed by Messrs. Armstrong, Whitworth & Co., Ltd., Walker-on-Tyne.*)
(*For particulars see p. 428.*)

THE NEW TORPEDO SCHOOL.

An important event which took place on October 1, 1923, was the transfer of the Vernon Torpedo School from the hulks in which it had been housed for many years in Portsmouth harbour to the new shore establishment in what was formerly the Gunwharf. The Whitehead torpedo department was moved to Vernon No. III., which, to avoid confusion, was renamed the Warrior, this old hulk thus resuming the name by which she became famous in the 'sixties as the first British seagoing ironclad. Costing over £650,000, apart from £200,000 for machinery, the new Torpedo School will prove of great value to the Navy.

PROGRESS OF RECRUITING.

It came as somewhat of a surprise to members of the House of Commons to learn, in June 1923, that while no special steps were taken to enter London boys for the Navy at the expense of those in other parts of the country, 34 per cent. of the total entries in Great Britain during 1922–23 were from the London district. Perhaps the fact that this was an abnormal year, with great reductions in the number of entries, had something to do with this high percentage from the capital. For some four months of the financial year, recruiting was suspended entirely, on account of the retrenchment in personnel which followed the Washington Conference and the Geddes Committee Report. Since it was reopened on July 10, 1922, there has been a gradual expansion of the rate of entry in most grades. By an order of July 13, 1923, the average number of boys entered was raised from 47 to 65 per week; and of second-class stokers from 43 to 54 per week; while plumbers were to be taken at the rate of 2 each quarter instead of 1; joiners, 4 per quarter instead of 2; and officers' cooks, fourth class, 37 per quarter, instead of 25. Where men who had been discharged under the reduction scheme of 1922 were allowed to re-enter, all time served before discharge, including any Army and R.A.F. time, was to be forfeited for pay, seniority, good conduct badges, or pension, and they were not, therefore, to be required to refund gratuities or bonuses awarded them under that scheme. From June 26, 1923, however, new entries with previous service in the Army or Royal Air Force were allowed to count such service towards increased pay after three and six years, respectively. Discharge by purchase was resumed at the beginning of 1923, after being in abeyance during the period when free discharges were being granted.

THE FUTURE OF GREENWICH HOSPITAL SCHOOL.

A word may be said here about the coming transfer of the Royal Hospital School, Greenwich, to a new site on the estate of Holbrook, Suffolk, presented to Greenwich Hospital by Mr. G. S. Reade as a token of his admiration for the services of the Navy in the war. This is, of course, the oldest training institution for boys for the Navy, having been established in 1712 in a ward of the Hospital.

In the course of two centuries, the site at Greenwich has become unsuitable for a large boys' school. Boat work, moreover, is impossible among the crowded Thames traffic. At Holbrook, it will be possible to rebuild the School on modern lines under the better conditions of pure country air, ample space for playing fields, and good facilities for boat work on the estuary of the River Stour, besides which the site is but four miles from Shotley. An additional advantage of the scheme is that the accommodation vacated at Greenwich is urgently needed for the much larger number of officers studying at the Naval College.

THE PAY OF THE NAVY.

Following many rumours about probable reductions in the pay of the Navy in advance of the date—July 1, 1924—upon which the rates of full pay become subject to review, in accordance with the arrangement made when the Halsey Committee reported in 1919, the Government, on April 2, 1923, decided to set up a Committee to inquire into the present standard of remuneration and other conditions of employment of the various classes of State servants employed in the Civil Service and in the three fighting Services. Sir Alan Garrett Anderson was appointed chairman, the other members being General the Hon. Sir Herbert Lawrence, managing partner of Messrs. Glyn, Mills, Currie and Co., and Sir W. Peter Rylands, President of the Iron and Steel Wire Manufacturers' Association and ex-President of the Federation of British Industries. The Committee were asked to include in their report a classified statement of increase in the numbers and cost of personnel in these Services consequent on duties imposed on them since July 1914, and the expansion of duties then existing.

This Committee's report was published on September 6. The attitude which was adopted towards the pay of the fighting Services as a whole did not command general approval. "In our view," said the Committee, "there is only one principle in which all the factors of responsibility, cost of living, marriage, children, social position, etc., are included—the employer should pay what is necessary to recruit and to retain an efficient staff." It is difficult to see how such a purely business view, even if it were desirable in itself, could be applied to such a service as the Royal Navy, the officers and men in which are not free to sell their labour in the best market. The Admiralty represented to the Committee that it was doubtful whether the naval rating received enough in 1914, but the Committee's view was that "the pay of the naval rating was not too low in 1914. It is now too high, and in our judgment should be reduced parallel with reductions in the pay of the rank and file of the Army, and in correspondence with the wages now paid in civil employment." Apart from his standard of intelligence and training, it is remarkable that the bluejacket is, according to this Committee, to be allowed nothing in respect of the risks and disabilities he incurs by the nature of his service, and of the privileges he surrenders compared with those in civil employment.

ATTRACTION OF SEA LIFE.

As regards officers, the Committee recommended reductions for junior officers up to lieutenant-commander, no change for those of middle rank, while they did not think that any of the Services erred on the side of paying their best men too much. The heavy responsibilities for life and property borne by junior naval officers did not impress them. "To our mind," they stated, "it is the chance of responsibility and of command that attracts the man who will do well in the Navy; in recruiting for any Service, pay is one, but only one, of the factors, and so far from agreeing that it is necessary to pay more in the Navy because young men are given a chance to prove their qualities and to make mistakes, we think that this would be a good reason for paying less. It is a major attraction of the Service to any young man of spirit." It is surely unfortunate that such a proposal to take advantage of the zeal of our young men for a sea life should be made at this juncture. Reductions of pay, within the 20 per cent. cost of living margin, were expected to be heavier among the juniors than the seniors, but the Committee's recommendations appear to be couched in an ungenerous and unfair spirit. They would scarcely have been put forward in 1918.

In regard to the Navy particularly, attention was roused in this matter of pay by the first report of the Select Committee on Estimates, published as a White Paper on June 21, 1923. This Committee pointed out that whereas in 1913–14 the establishment of the Navy consisted of 151,000 men and the cost for pay was £8,800,000; in the year 1923–24, the establishment is only 99,500 and the cost for pay £14,000,000. Though the increase in the cost of living is about 70 per cent., the pay of the seaman has been increased by 150 per cent., in addition to which he receives a marriage allowance. In the case of the officers, the pay has been increased by 60 to 70 per cent. The Committee directed attention to the fact that there was no difficulty before the war in getting officers and men for the Navy at the rates of pay then ruling, the inducement for boys to enter the Service being certainly the attraction of sea life.

THE CASE FOR THE NAVY.

Vigorous criticism was naturally directed to this report, by Lord Long, Captain P. B. Garrett, Commander Viscount Curzon, M.P., and others, who pointed out that the 1919 increase was not so much due to the higher cost of living, but because the former pay was totally inadequate for the services rendered. Lord Long, who wrote with special authority as an ex-First Lord, stated in the *Times* that there are special considerations governing the services of the sailor which do not apply, at all events, to the soldier: (1) He has to maintain himself on board ship and his family at home; (2) he is liable at any moment to be ordered on a long cruise during which he is confined to his ship, unlike the soldier, who, whether in camp or in barracks, can get out and about when off duty; (3) perhaps most important of all, in peace time he is exposed to constant risks which may at any time lead to instant disaster.

Most unfortunate was considered the Committee's suggestion that the attraction of a sea life to boys, and the state of employment, should form a basis for calculating the pay of men who have to be so highly skilled as those of the modern Navy. It would indeed be a bad day for the country if its naval officers and men were "remunerated" on such a deplorable and shabby system. The effect upon the contentment and efficiency of the Fleet would be disastrous. Such a retrograde proposal savours of the lowest form of sweated industry, and it is surprising that it should ever have come within the purview of a House of Commons Committee, more especially as so many other factors which enter into the problem as far as officers are concerned, such as the payment of income tax at full rates, the reduction of many allowances, and the long terms of unemployment which are again becoming common, were ignored. No wonder that, as Commander Viscount Curzon stated, the report was not in any way unanimous.

The coming year, therefore, will be an important one for the naval officer, from the standpoint of his pay, since whatever the decision of the Government may be after full consideration of the recommendations of the Anderson Committee, the existing rates of full pay are subject to review on or after July 1, 1924. The arrangement made in 1919, as described at the head of the pay tables in the quarterly Naval List, is that "20 per cent. of the rates of full pay is to be considered as due to the high cost of living in July, 1919, and is subject after five years to change either upwards or downwards according as the cost of living rises or falls; the revision thereafter to take place every three years, up or down, on the basis of the Board of Trade food prices index number." These index figures have been severely criticised, and certainly do not inspire confidence among the bulk of our naval personnel. There is a feeling also that what was given with one hand in 1919 has since largely been taken away with the other, by the new rules regarding income tax, allowances, and other matters which affect the emoluments of officers.

ALLOWANCES REDUCED.

The principal changes affecting emoluments during the past year may be briefly recorded. From April 1, 1923, victualling allowance was reduced from 1*s.* 6½*d.* to 1*s.* 6*d.* a day; and provision allowance, for officers, from 3*s.* 6*d.* to 3*s.* 5*d.* a day, or from £56 10*s.* to £55 per annum, while for men (including long leave allowance), it was reduced from 2*s.* 8*d.* to 2*s.* 7*d.* a day. From October 1, 1923, victualling allowance was further reduced to 1*s.* 5½*d.* a day; and messing allowance from 9½*d.* to 9*d.* a day. As stated in last year's "Annual," table money has been down to pre-war rates since July 1, 1922. In this connection the Admiralty recognised during 1923 that cases might arise in which an abnormal amount of expenditure was necessarily incurred by flag officers, either at home or abroad, in the entertainment of officers or officials of other countries. To meet such cases, a limited amount is placed annually at the disposal of the Board to reimburse officers for such expenditure, and a further limited sum is provided for special entertainment by squadrons or ships.

The grant of a marriage allowance to naval officers is still postponed, though it has more than once during the past year been stated to be under consideration. From April 1, 1923, reductions took effect in the rates of marriage allowances to the men of the Royal Navy and Royal Marines. These rates are fixed according to the Ministry of Labour index figure of the cost of living on Jaunary 1 in each year, in which, it must be admitted, little confidence is felt in the Service. For the current financial year, the rates paid are those under the figure 80 in the sliding scale, the cost of living figure on January 1, 1923, having been 78. In the previous year, the rates were those under 90 in the sliding scale, the cost of living on January 1, 1922, having been 92. In the year 1921–22, the rates were those under figure 160. The reduction in two years amounts, in some cases, to 40 per cent., the allowance to a wife and six children, for instance, having come down from 41*s.* to 25*s.* per week.

The abolition on January 1, 1923, of the allowance of 4*d.* and 2*d.* a day respectively to searchlight operators and manipulators was typical of many such additions to the men's pay which have been done away with since the war. Officers' allowances, too, have suffered curtailment or abolition. Hard-lying money is now payable at full rates continuously only in the Submarine Service. To qualify for the award of this extra pay, vessels other than submarines and ships undergoing trials must be employed mainly on sea service, *i.e.* continuous service involving lengthy periods in the open sea, or voyages between distant ports irrespective of periods incidental to such service spent in port, it being essential that the crews live and sleep on board the vessels during considerable periods in the open sea as well as in port. In such circumstances, application may be made to the Admiralty, provided the living and sleeping conditions are not superior to those which obtained in the old torpedo-boats. In this category would normally be placed trawlers, drifters, motor launches, and so on, very few of which would fulfil the conditions specified, for hard-lying money is not granted to vessels employed exclusively in harbours or smooth waters like Spithead or the Firth of Forth.

TAXING LODGING ALLOWANCE.

Another ruling which leaves a large number of naval officers worse off financially than before, is that relating to the taxation of their lodging allowance. For the financial year 1922–23, officers and men of the Royal Navy and Royal Marines who are in receipt of lodging allowance, and who hold appointments for a fixed or a practically fixed term, are subject to income tax in respect of the allowance. For this purpose, any appointment in which the allowance is drawn continuously for a period in excess of ninety-one days is regarded as held for a fixed term. As an exception to the rule, the allowance is not taxed of officers undergoing the Senior Officers' War Course and the Secretaries' Course, in view of the greater liability in the case of these officers of being appointed elsewhere without notice, although the courses normally exceed ninety-one days. A very doubtful point is raised by this order, for since lodging allowance is paid to officers serving in exceptional positions when not provided with official accommodation as part of their regular emoluments or salary, it is clear that the allowance is "an expense involved in earning a salary," and as such should not be assessable to income tax. It is remarkable, now that naval officers pay the same rates of tax as civilians, that they should not be accorded the same privileges as are enjoyed by the rest of the community.

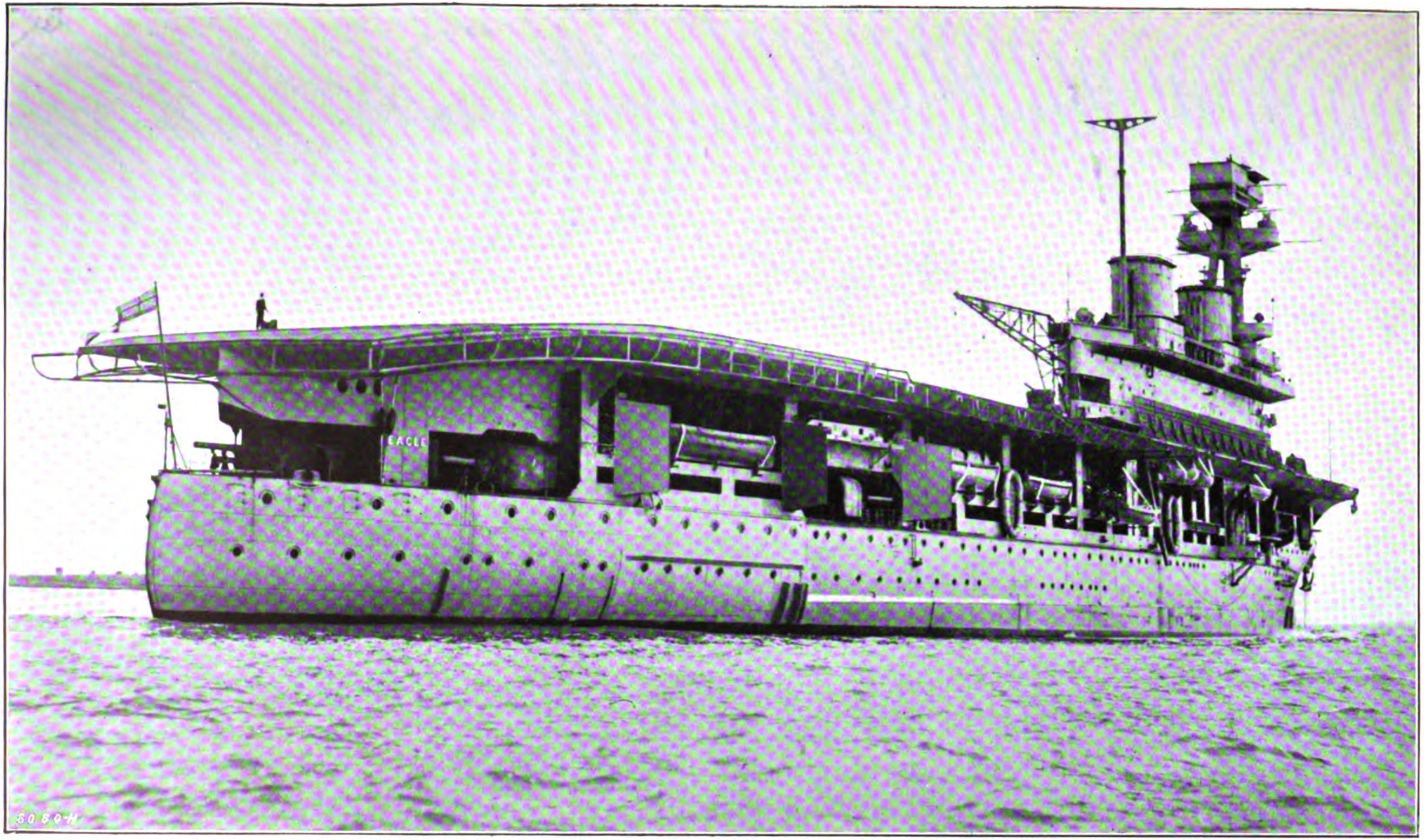
It is pleasant to turn to one item in which a concession has been made during the year. This relates to the issue of railway tickets at reduced fares to officers and men when travelling on leave. An order of July 27, 1923, extended these cheap tickets, and it is possible for officers to obtain them, at the rate of single fare and a third for the double journey, from any station in the official list (including over 180) to any railway station or port in Great Britain, and to ports in Ireland *viâ* direct boat. Formerly, officers' tickets were issuable for journeys to London only.

PROMOTION AND PROSPECTS.

The retrenchment scheme of May 12, 1923, has run its course, and it is now possible to gauge the effect of this far-reaching measure for clearing the lists. The following figures, taken from the official Navy List, will indicate the differences made after the scheme in the ranks principally affected by it:—

	July, 1923.	May, 1922.	May, 1920.	Nov. 1918.
Captains, R.N.	234	349	365	364
Commanders	391	573	604	607
Lieutenants	1,272	1,781	1,432	1,641
Engineer-Commanders	242	343	368	399
Engineer-Lieutenants	212	246	214	234
Paymaster-Commanders . . .	155	176	192	193
Paymaster-Lieutenant-Commanders .	129	169	201	161
Paymaster-Lieutenants	184	208	231	206
Totals . .	2,819	3,845	3,607	3,805

It will be seen from the above that the actual reduction in the ranks specified amounts to over 25 per cent., and is well over that proportion in some grades, including the captains and commanders. The reduction is the more striking in contrast to the totals for 1920, when there was already a tentative retirement scheme in progress. Altogether, including warrant officers, who are not shown above, about 2,000 officers left the Navy under the scheme of 1922, including 600 of the executive branch whom, as explained by the First Lord in his Memorandum, it was necessary to select for retirement.



(Photo: Stephen Cribb, Southsea.)

H.M. AIRCRAFT CARRIER EAGLE: STERN VIEW AFTER RECONSTRUCTION.

Constructed by Messrs. Armstrong, Whitworth & Co., Ltd., Walker-on-Tyne.)
(For particulars see p. 428.)

FLAG OFFICERS AND EMPLOYMENT.

The reduction in the establishment of the Flag List from 92 to 77 is being effected gradually, the method being not to advance captains to rear-admiral in every vacancy which occurs. Thus the retirement at his own request on August 1, 1923, of Rear-Admiral C. D. Carpendale, C.B., was not followed by a promotion; but in the next vacancy, which occurred on August 2, when Rear-Admiral F. A. Whitehead, C.B., retired at his own request, the senior captain was advanced. Up to this time, 1 admiral and 7 rear-admirals had been retrenched out of the totals of 2 admirals, 3 vice-admirals, and 10 rear-admirals, by which it was decided in February 1922 to reduce the list. It is a doubtful point whether this reduction is good for the Navy, seeing that it must operate to retard promotion for captains and commanders, already slow enough. The purely financial view that it is wrong to keep officers on the list for whom there is no employment does not take into account all the needs of the Service. The larger the Flag List the wider the field of selection for commands, and the greater the opportunities of captains attaining that position in which they can best serve the country in case of war. On the other hand, it must be admitted that in a time like the present, and with the stringent rules for retirement in the event of non-service, the fewer opportunities of employment may cut short the career of an officer of exceptional distinction and capacity who, had the Flag List been smaller, might have continued to serve in a lower rank. This was indicated when the Admiralty, in July 1923, selected a vice-admiral five places down the list to be Commander-in-Chief at Plymouth, although there were officers of full admiral's rank eligible. This was the result of the reduced number of appointments open to vice-admirals. Unless officers of the last-named rank were considered for appointment to the home port commands, some with distinguished war service would not only be compelled to spend exceptionally long periods on half-pay, but would perhaps run the risk of being retired for non-service. The fact is that every aspect of the rules for promotion and retirement needs constant watching in the interests of the service as a whole. The tightening up of the non-service clauses before the war served their purpose in helping to give us a young Flag List, but it does not follow that they will always operate to advantage. They are the necessary accompaniment of a large Flag List when employment is plentiful, but with a reduced establishment and fewer appointments, they cannot be held to be altogether beneficial to the Navy if they penalise a good senior officer merely to promote a junior one.

NON-SERVICE IN THE MARINES.

In this connection an interesting innovation during the past year was the introduction of non-service retirements in the Royal Marines. Commissioned officers of, or below, the rank of colonel-second-commandant are to be retired on completion of two years' non-service, or, if placed on half pay or unemployed pay, on return from extra-regimental employment or for sickness, on completion of three years' non-service. The new regulations, dated April 20, 1923, apply to all officers entered or promoted to a higher rank in the Corps on or after October 25, 1922. It is interesting to note the provisions of the new regulations in regard to general officers. Major-generals will be retired on completing three years from their last date of service in the rank, or, if not employed, on the completion of three years from the date of promotion. The same rule applies to lieutenant-generals and generals, with the proviso that no officer is retired before completing one year from the date of his last promotion.

It is curious that such rules as this should come into force at a time like the present, for apart from the post of Adjutant-General there is no regular employment for marine generals, and consequently it would seem that more of them are likely to be taken off for non-employment than for age. The general list, in fact, will be completely changed in the course of about three years, whereas at the time of the armistice some officers had been on it for over ten years. Manifestly, the object is that, without work being available for them, the generals had better be removed from the active list at more frequent intervals in order that the advancement of their juniors may be speeded up, and therefore the problem is different to that in the Royal Navy, where there is always a certain proportion of employment for flag officers.

PROMOTION ZONES.

No change was made during 1923 in the zones of promotion for executive officers, which remained at 5½ to 8 years' seniority on the date of selection for commanders for advancement to captain; and 3 to 6½ years' seniority for lieutenant-commanders for advancement to commander. Although these zones are narrower than those which formerly obtained, an extension of them to something like the limits which prevailed before the war is hardly to be expected until the heavy promotion lists made during the progress of hostilities have been worked off. The zone for the promotions to captain in December 1923, included all commanders promoted to that rank from the end of 1915 to the middle of 1918; and the zone for commander included all lieutenant-commanders advanced between midsummer 1917 and the end of 1920. The former zone included something like 119 commanders from whom 10 captains had to be chosen on this occasion; and the latter zone some 272 lieutenant-commanders from whom 20 commanders had to be chosen. It is easy to work out the proportion which the successful candidates bear to the total, and the chances of an officer for promotion during the time he remains in the zone. At the best, it will be admitted that competition is indeed severe, especially when it is remembered that there are many deserving officers who are outside the zones fixed by the Admiralty.

In the engineer branch, there was a lowering of the zone for promotion to the rank of engineer-commander, which was fixed at three years' seniority as engineer lieutenant-commander and over, instead of four years and over. The conditions, however, are very different to those in the executive branch, as there was an interregnum in the advancements to engineer lieutenant-commander following the promotion of the last Keyham-trained engineers of the old scheme, and practically no advancements to the rank took place in 1921–23.

The only other change of importance regarding officers' promotion concerned the signal branch, in which the term "signal lieutenant" had been adopted since January 1920, for commissioned officers from warrant rank. On April 13, 1923, the Admiralty announced that the subjects of examination for accelerated promotion by selection to this rank had hitherto been the same as those laid down for gunners, gunners (T.), and boatswains, the intention being that any officers thus promoted should be available for employment as lieutenants in the same manner as those similarly promoted in the other branches mentioned. Under existing conditions, such employment would not be practicable, but in order to afford an opportunity for accelerated promotion to signal lieutenant, modifications were made in the scheme of examination. The educational test is now confined to general subjects, special subjects being omitted. In lieu of the former professional subjects, candidates are required to pass a special examination in visual signalling. The professional examination may not be taken until the candidate has attained the rank of commissioned signal boatswain, and failure to pass does not affect subsequent promotion to signal lieutenant under ordinary regulations.

LOWER DECK PROMOTIONS.

The scheme for selecting young naval ratings of promise for advancement to the commissioned rank of mate, R.N., is being continued on a much smaller scale than before the war, when it formed one of the means by which the Admiralty sought to make up the deficiency of junior officers caused by the expansion of the Fleet. During 1913, the first year the scheme was in working, 44 ratings qualified for the rank of mate, and there were large numbers who attained it during the war, when the rank of mate (W.T.), since abolished, was created. Since the war, only about half-a-dozen ratings each year have qualified for commissions in this way, although in March 1923, Mr. Amery, referring to the six who were selected in the previous December, said that this number would have been greater had a sufficient number of qualified and recommended candidates who were suitable for promotion come forward. During the past year, an interesting stage was reached in the progress of this scheme, the officers who were first promoted by it having attached the rank of lieutenant-commander. Of the 13 who were in the original batch, promoted to mate on February 14, 1913, only 3 remained on the active list in August, 1923, Lieutenant-Commanders Lionel McIntyre, who had just completed four months' study in France; James Figgins, second-in-command of the minesweeper Burslem in the Patrol and Fishery Protection Flotilla; and

Ernest Beeley, D.S.C., commanding the destroyer Wakeful, tender to the torpedo schoolship Defiance. Of the second batch of 7, promoted in May and July, 1913, only 2 remained, Lieutenants Joseph F. Dunne, commanding destroyers in reserve at Portsmouth; and Edward Enright, second-in-command of the destroyer Woolston, Atlantic Fleet. In this group, however, was Squadron-Leader Frederick J. Rutland, D.S.C., A.M., who flew the aeroplane sent up to scout for Admiral Beatty at Jutland, and who is now attached to the Coastal Area of the Royal Air Force for special duty with H.M.S. Eagle.

January 1, 1923, saw the inauguration of a new scheme of advancement to leading rates and above, which applies to all branches of naval ratings serving under continuous service engagements. The Board approved of a uniform system being adopted as regards the periods of good conduct required for advancement, or for readvancement after disrating for misconduct, to leading rates and above. The former system ordinary rosters were closed after December 30, 1922. In order that ratings who were nearly at the top of the old rosters might not be unduly prejudiced, advancement in each grade was to be made, as vacancies occurred, alternately from the new and the old rosters. A revised form of conduct sheet came into use as part of the scheme.

Fewer Punishments.

Publication of the returns of the number of courts-martial held and summary punishments inflicted on seamen in the Royal Navy has now been resumed, beginning with the year 1922. It was not possible to compile the return for the years 1914–21. To all observers of current naval affairs, the almost entire absence of serious crime, and the decline in the number of offences against discipline, are gratifying features. They illustrate the great improvement which has taken place in the present century in the education and character of the bluejacket, and also the much better conditions under which he is called upon to serve. Instead of desertion from the Navy being a common occurrence, it is now very rare; indeed, perhaps the worst punishment which can now be given to a man is to dismiss him from the Service. Much benefit must have resulted also from the policy of weeding out undesirable characters. An exceptional opportunity for the exercise of this policy presented itself during the post-war reductions.

Uniform and Clothing.

Among a number of changes made in the uniform regulations of the Navy during the past year, perhaps the chief was that of April 20 re-establishing No. 1 or Full Dress under conditions similar to those which obtained before the war. Previous to the date mentioned, Full Dress had been worn only at his Majesty's Levees at home. It is now worn on State occasions at home and abroad; when receiving the King, the Queen, or other crowned Heads, at home or abroad, unless specially ordered otherwise; and at ceremonies or entertainments when the Senior Officer present considers it desirable to do special honour to the occasion. A note to the order for its revival stated that officers not in possession of Full Dress might wear No. 3 (Frock Coat with Epaulettes), except at State Balls, where Full Dress is obligatory. This concession was advisable in the circumstances, seeing that there must be several officers who, even now, are uncertain of remaining much longer in the Service, and to whom the maintenance of Full Dress would entail heavy expense. It is a good thing to revive pre-war dignity, but not if it operates hardly on the officers who have to maintain it, and in this connection it is not the most opportune time to make the change when preparations are being made to reduce the rates of pay.

Service chevrons, wound stripes, and silver war badges for services rendered are no longer worn in naval uniform. Since July 1919, they had been optional as from the date of the proclamation of peace, and in consequence fell into disuse. The order for their abolition was not, therefore, unexpected. Another order, having for its object to regularise conflicting practice, was that of February 7, 1923, abolishing the black silk bow necktie formerly worn by chief petty officers and other ratings not dressed as seamen. The uniform necktie for these ratings is now of the long pattern, of black silk, tied in a sailor's knot. The wearing of the older pattern black silk bows became much less general during the war, chiefly because these bows required to be worn with stiff collars and fronts, whereas the ties could be worn with soft collars. In March 1923, the Admiralty ordered a black silk necktie to be substituted for the bow in the kit of coloured officers' stewards and cooks entered locally on the North America and West Indies Station.

The concession, in April 1920, to the senior petty officers of being allowed to wear Class III. uniform, with jacket and peaked cap, gilt buttons and a gold cap-badge, as a means of improving their status, was extended by a Fleet Order dated February 7, 1923. Formerly restricted to petty officers with over four years' service as such, it is now granted to all petty officers with one year's service as such, and confirmed in the rating. Men dressed as seamen who became entitled to the "fore-an'-aft rig," under this order, were given a gratuity of £14 to meet the cost of the change, the effect of which was to reduce still further the proportion of men in the Navy dressed in the old-fashioned seaman rig. On August 24, 1923, the new uniform was also granted to petty officers in the R.N.R. and R.N.V.R. who had completed one or more years' mobilised service in the rating, and had been confirmed in it.

Other uniform changes which may be briefly mentioned include the permission to naval ratings to wear brown canvas shoes with No. 5 dress in hot climates, or at such other times as may be authorised by the commanding officer; and the provision of a uniform and kit for assistant-bandmasters, band-corporals, and bandsmen in the Royal Naval Volunteer Reserve. These men are to wear a quasi-military, or quasi-marine, uniform, including a blue serge tunic, with brass crown-and-anchor buttons and brass lettering, "R.N.V.R.," on the shoulder-straps; blue serge trousers, with $\frac{1}{4}$-in. red piping in the outside seams; a peaked cap, with red badge; and web-leggings. Bandmasters have the same uniform, but with a C.P.O.'s gold cap-badge, and gilt buttons, and also a harp as distinguishing badge on the lower part of the sleeve.

NAVY VICTUALLING.

While there have been no alterations in the system of Navy victualling since the last issue of the "Annual," some interesting changes in details of the seamen's dietary deserve mention. One of these changes concerned an historic item—salt pork. It was represented to the Admiralty that this was not appreciated as a ration on certain foreign stations, and also that its issue to ships in the tropics was undesirable for dietetic reasons. Arrangements were therefore made for tins of the meat and vegetable ration, such as were already in use as an extra issue in the Submarine Service, to be sent to the victualling yards at Malta, Hong Kong, Bombay, the Cape, and Bermuda. Each yard was to issue them for trial alternately with "preserved meat and accompaniments," as a substitution for the ration of salt pork, split peas, and celery seed, when fresh meat was not available, and reports were to be made whether the change was recommended as a permanent measure. The issue of salt pork had already been discontinued in ships on the West Coast of Africa. Salt beef, moreover, had been abolished in June 1905.

Another article which has disappeared from the seamen's dietary is tinned rabbit. As this was not taken up to any extent in the Fleet, no further issues were made from the victualling yards after the end of 1922, and the article was ordered to be removed from the list of Service provisions. Under the heading of "extra war emergency comforts," tinned baked beans were ordered to be supplied for issue to crews of submarines on long-distance trips, in lieu of the tinned green peas and French beans formerly supplied for this service.

An indication of the greater attention now paid to the selection and training of cook ratings in the Navy was afforded by a series of orders issued during April and May, 1923, relating to these matters. Separate examinations have to be passed for men before advancement to leading cook, petty-officer cook, and chief petty-officer cook, based on the following subjects:—(1) time required for cooking various meats; whether they should be started in hot ovens, hot or cold water; (2) suitable sauces, etc., for meat; (3) running of oil-fuel galleys; (4) invalid cookery; (5) general messing; (6) precautions for tinned food products; (7) cleaning of kitchens and utensils; (8) question on the use of salt, etc., during cooking; (9) importance of well-cooked vegetables in a meal; (10) handling of a joint; and (11) calculation of quantities, proportions and percentages.

NEW SUPPLY BRANCH.

During 1923 there came into existence a new Supply Branch in the Navy, following the adoption in the Atlantic Fleet in 1920 of a system of central storekeeping which gave excellent results in practice. In the ships fitted for central storekeeping, the work of dealing with stores was undertaken from the beginning of 1923 by the Victualling Branch, which, in order to cope with the additional work, was increased by volunteers from other branches, and this augmented department was called the Supply Branch. The main idea of the change was to transfer the charge of all naval stores—inventory, permanent, consumable, and other—from the departmental officers formerly responsible, such as the engineer, gunner, torpedo, boatswain, shipwright and navigating officers, to the accountant officer of the ship. Naval ordnance and torpedo stores, however, were not affected. Thus the technical officers were relieved of the extraneous duties of storekeeping and accounting each in his own department. The titles chosen for the new ranks and ratings in the Supply Branch were:—Commissioned supply officer (Cd.S.O), warrant supply officer (Wt.S.O), supply chief petty officer (S.C.P.O), supply petty officer (Sy.P.O.), leading supply assistant (L.S.A.), and supply assistant (S.A.) The initials "Sy.P.O." were used to avoid confusion with the rating of stoker petty officer.

Analysed carefully, the results obtained from central storekeeping were stated in an official memorandum on August 10, 1923, to have been beneficial both from the standpoints of economy, and the effect on administration and fleet efficiency. It was estimated that the saving due to the part working of the scheme during the financial year 1922–23 had exceeded £100,000, and that the recurrent saving was approximately £50,000 a year on the basis of present prices. This indicated a saving of about £2,000 a year in the case of a capital ship and £1,000 a year in that of a light cruiser. The memorandum added: "There is no doubt that a greater measure of control is exercised over expenditure under the new system than could have been exercised under the old one. The main feature, viz., the valuation allowance, provides what is in effect a system of rationing. . . . Another feature of the new system which makes for economy is the opportunity it affords, quarter by quarter, for effecting a comparison between the actual cost of maintenance of different ships of the same class employed on similar services. Under the old system such a comparison was absolutely impossible. . . . Another advantage is that stores now have to be transported only to one officer instead of to five, and that only one set of demands are required instead of five. This . . . has reduced to a minimum the time required for storing H.M. ships."

THE R.N. BENEVOLENT TRUST.

The establishment of the Royal Naval Benevolent Trust was recorded last year. During 1923 steps were taken to stabilise the Trust and place it in a better position to carry out its objects. The Admiralty represented to the Fleet that the voluntary system of donations by canteen committees was inequitable in principle and likely to prove insufficient in amount. It was therefore suggested that one-fifth of the amounts received by ships and establishments from the Navy, Army, and Air Force Institutes as rebate should be handed over automatically to the Trust, thus ensuring that all who were eligible to share in the benefits should contribute to the fund. The feeling of the men was ascertained on this plan, and on June 15, 1923, it was announced that the result of this referendum was overwhelmingly in favour of it. Some ships made the suggestion that it should be tried at first only for two years, so as to enable the position to be reconsidered at the end of that time. This will accordingly be done. At a meeting in Devonport in April 1923, to explain the working of the Trust, Rear-Admiral the Hon. Sir Hubert Brand, the original Hon. Treasurer and first President, referred to the erroneous impression that the Admiralty were controlling its administration. The Board, he said, appointed the President, who served three years, and five Governors. They also provided the money to start the Fund; but beyond that had nothing whatever to do with it. The Trust was entirely administered by the men themselves. Every man, when it came to the question of relief, was treated equally. When naval disasters occurred, the Committee immediately traced the dependents and looked after them.

WELFARE COMMITTEE DECISIONS.

The decisions were published on June 26, 1923, upon the requests put forward through the Welfare Conference of 1922. There were 56 general requests put forward, ranging from one that a permanent Port Welfare Committee should be instituted, to one that the issue of home-killed beef and mutton from the home victualling yards should be reverted to. The Admiralty pointed out in some introductory remarks, that a considerable number of requests referred to accommodation, which question, especially as regards the older ships, had become one of great difficulty, as the increasing demands on the limited space available tended to prejudice seriously the fighting efficiency of ships. But a Committee is now going into the whole question, and the Board will give sympathetic consideration to any measures which may be found possible for increasing the comfort of the men without impairing fighting efficiency. As regards the requests involving considerable charges to the public, the Board wished it to be realised that in the existing financial situation such requests could not be expected to achieve a favourable result.

The Committee on Accommodation referred to, was appointed early in the year under the presidency of Rear-Admiral Douglas L. Dent, C.B., C.M.G., Director of Naval Equipment, and included Captain V. H. S. Haggard, C.M.G., Director of Training and Staff Duties; Captain G. W. McO. Campbell, Assistant Director, Mobilisation Department; Captain R. A. S. Hill, in charge of the Naval Personnel Committee, and Mr. L. Woollard, of the Naval Construction Department; with Mr. J. Lawson, of the Naval Branch, as Secretary.

SPORTS AND RECREATION.

Excellent work continued to be performed during the year by the Sports Control Board, the secretaryship of which was relinquished in August by Engineer-Commander E. W. Roberts, who had held office since the inception of the Board in March 1920. He was succeeded by another well-known Rugby player, Lieutenant-Commander R. L. Burnett, formerly Physical and Recreational Training Officer on the Staff of the Atlantic Fleet. In October, Captain Charles W. R. Royds, C.M.G., was succeeded as Director of Physical Training and Sports by Captain Ernest Wigram, C.M.G., D.S.O. The two half-yearly reports issued by the Control Board during the year indicate that its activity is spread over all forms of sport and recreation in the Navy.

By a new Fleet Order, injuries sustained by officers and men through participation in games and other forms of physical recreation definitely organised by or with the approval of the proper naval authority are to be regarded as due to the Service, and "hurt certificates" are to be issued in respect of them, without reference to the Admiralty, providing the other provisions governing the issue of such certificates are observed.

THE YEAR'S WORK.

For the greater part of 1923, the strength of the Fleet under Admiral Sir Osmond Brock in the Mediterranean had to be reinforced owing to the crisis in the Near East. Following the conclusion of peace with Turkey, the last of the vessels lent from the Atlantic Fleet returned to their home ports. These were the battleships Resolution and Royal Sovereign and the Fourth Destroyer Flotilla. The Second Light Cruiser Squadron had returned in the spring, as had also the Third Flotilla. When, early in February, the Turks put forward a demand for the withdrawal from Smyrna of all foreign warships of more than 1,000 tons, the presence of an Allied naval force at this place was effective in convincing the Turks that the Powers would not recognise any such restrictions imposed in Turkish ports until peace had been concluded. The Curacoa, Captain Hugh C. Buckle, flying the flag of Rear-Admiral Wilmot S. Nicholson, C.B., was at the time on duty at Smyrna. Supported by the battleships Emperor of India, Captain A. K. Macrorie, C.M.G., M.VO., and Resolution, Captain J. E. T. Harper, M.V.O., which were ordered to the port, Rear-Admiral Nicholson entered the harbour, after giving due warning, in order to vindicate the Allies' right to free entry. No untoward incident occurred, the Turks accepting the principle without opposition. In September, Mr. Amery, the First Lord, visited the Fleet under Admiral Brock, at Constantinople and the Dardanelles.

In other parts of the world, the services of the Royal Navy have been in demand in support of the forces of law and order. What the First Lord called "a typical instance of the varied work of the Navy under peace conditions" was the despatch of the light cruiser

Caledon, Captain Dudley North, C.S.I., C.M.G., C.V.O., to the Baltic port of Memel in the middle of January, when Lithuanian irregulars entered the place in an attempt to include it within their territory. The Paris Conference of Ambassadors decided to send an Extraordinary Commission, with power to set up a Provisional Government, to restore order, and the trouble soon subsided.

Further north, need was shown by certain events off the Murmansk coast for the maintenance of the sloop patrol for the protection of the British fishery there, trawlers being arrested by the Soviet authorities. Steps were taken in April to increase temporarily the number of vessels in North Russian waters, so as to ensure that one would always be on the fishing grounds. Not having wireless, however, the trawlers endured a certain risk in operating within an area extending to upwards of 150 miles in length. The orders to the sloops Harebell and Godetia were to prevent interference with British vessels outside the three-mile limit, using force if necessary. The Soviet claimed to extend the limit of territorial waters from three miles to twelve. It is vitally necessary, from the naval point of view, that any such extension of territorial limits, whether for fisheries or other purposes, should be resisted by the British Government.

SUPPRESSION OF SLAVERY.

A recrudescence of slave-running in the Red Sea and Persian Gulf was referred to in the First Lord's Statement. Here again the utility of the sloops maintained in those waters was demonstrated by the capture of dhows and the release of the unfortunate slaves in them. An "old Warspite boy," writing in the Marine Society's journal of the capture of a slave dhow by the sloop Cornflower, said that it contained boys and girls between the ages of seven and seventeen, and that it was heartrending to stand by and see the hungry children ravenously attack the bread which was given them by the bluejackets.

Landings have been made once or twice during the year by the ships in China on occasions of local disorder, but the outstanding event of the year in the Far East was the terrible earthquake in Japan, on September 1. The Commander-in-Chief, Admiral Sir Arthur Leveson, proceeded in the flagship Hawkins from Shanghai to Yokohama, as did the submarine depôt-ship Ambrose and the light cruiser Despatch; while the Durban went to Kobe. Their purpose was to convey medical stores and food, and to assist refugees.

The more settled state of affairs in Ireland has led to fewer ships of the Navy being stationed in those waters, only two destroyers being in the neighbourhood of Queenstown for most of the year. The Rhine Gunboat Flotilla remained unchanged during 1923, consisting of five motor launches under a Commander, R.N.

The cruises of the Atlantic Fleet, and of the various squadrons on foreign stations, followed the lines of those undertaken in previous years since the Armistice. For the second year in succession, a series of bombing trials took place in the Channel at the beginning of August by the Royal Air Force, using the Agamemnon as a target. They were again rather inconclusive, and served to show how largely the weather influences operations by aircraft in their present stage of development.

It is satisfactory that the year since the last issue of the "Annual" has had no serious mishap in the Service, such as those which in the previous year resulted in the loss of the light cruiser Raleigh, the destroyer Speedy, the drifter Blue Sky, and submarine H.42. An explosion on board the light cruiser Coventry, at Gibraltar on March 8, 1923, owing to the fracture of an air pressure pipe, caused the death of two ratings; and at Hong Kong on August 18, submarine L.9 was sunk during a typhoon, but was salved a few days later, there being no loss of life.

CHAS. N. ROBINSON.

CHAPTER II.

FOREIGN NAVIES.

A new and striking development of naval policy, reacting on naval preparations throughout the world, appeared at one time to be indicated in the American Naval Appropriation Act, 1923–24, which, in its final paragraph, laid down the following instruction:—"The President is requested to enter into negotiations with the Governments of Great Britain, France, Italy, and Japan, with the view of reaching an understanding or agreement relative to limiting the construction of all types and sizes of subsurface and surface craft of 10,000 tons standard displacement or less, and of aircraft." The request turned upon questions, unaffected by the decisions at Washington, which it was hardly supposed would be raised at such an early date in view of the course of the discussions at the Conference.* No such limitation as Congress proposed is imposed by the Treaties, and only in the second Treaty are submarines affected, it being stipulated (Art. IV.) that there shall be embodied in the law of nations a prohibition of the use of such vessels as commerce-destroyers. The main Treaty is concerned only with capital ships and aircraft carriers, and the restriction of other vessels to a maximum of 10,000 tons, with guns not exceeding 8 in. calibre.

The action of Congress was presumably due to the fact that, after the dispersal of the Conference, the competition in building cruisers, destroyers, and submarines had begun afresh, if it can be said that it had ceased. Some American papers censured Japan for starting a new phase of competition by putting in hand the auxiliary fighting programme she had adopted before the Conference assembled at Washington. France, also, after considerable delay, had decided to add to the number of her cruisers, evidently resenting the lower relative position in capital ships to which she had been reduced by the main Treaty. The United States Cabinet was eventually moved to take action, and the Departments have been busy in mapping out a policy with a view to maintaining the American Navy, in respect to cruisers and all auxiliary fighting craft, at the strength needed in the opinion of responsible naval authorities to round off the battle fleet stipulated in the main Treaty. The disturbed and threatening situation of the world, it speedily became manifest, had not created an atmosphere favourable to any proposal for a further limitation of naval armaments, consequently no action has been taken by the President.

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* On this subject France has taken a very strong line. When the Ratification Bill was discussed by the Chamber, M. Poincaré, M. Briand, and M. Raiberti, Minister of Marine, all emphasised the right of France to build such light vessels as she pleased.

To this extent have the Washington Treaties disappointed their authors; they have not stopped all naval competition, but have seemingly accelerated it in some directions.

The building of naval aircraft in increased numbers is a fresh feature to be recorded, and in the United States and France, the new light cruisers which are being built are intended to carry seaplanes which will be launched by catapults. All the chief maritime Powers are devoting considerable attention, indeed, to the strengthening of the air arm of their fleets, and only in Great Britain has the Fleet been deprived of its freedom to provide for its own needs in this direction.

UNITED STATES.

American naval policy, which is based upon the decisions of the Washington Conference, was inevitably dependent upon the endorsement of the Treaties by all the Powers concerned. The hesitancy of France in ratifying the main Treaty caused a painful impression in the States, and Mr. Denby, as Secretary of the Navy, said in September 1922, that the scrapping programme had been held up owing to the complications of European politics. On the 25th of the same month he stated that the Maine and Missouri had been sold, and the Rhode Island, Georgia and Nebraska stripped preparatory to scrapping*; but he added that though the new ships had been stopped, no steps had been taken which "would interfere with their completion should that be determined upon." Though much scrapping had taken place in the British Navy, elsewhere the Washington Treaty had not advanced much beyond the "paper stage."

A good deal of disappointment was caused in the United States by the delay in counter-signing the Treaties. The Navy Department had indicated its policy with perfect candour, but an unfortunate atmosphere of suspicion was created by what had occurred. Lord Balfour, on behalf of the British Empire Delegation, had said at the Conference, without apparently sufficient naval support, that "the use of the submarine, whilst of small value for defensive purposes, leads inevitably to acts which are inconsistent with the laws of war and the dictates of humanity." The French Delegation, while giving full adhesion to all the claims of humanity, had maintained the value of the submarine, and had declined to receive dictation as to the number or the manner of employment of vessels of the class. In the result, clauses were drafted and adopted limiting the use of submarines and interdicting their use against merchant ships. Admiral Sims has recently most energetically protested against the United States being bound by this Article—Article IV. of the second Treaty of Washington—which forbids the use of submarines as commerce-destroyers. This conflict of views seemed to shake confidence in the full intended effect of the Treaties. Another matter that caused some concern in the United States was the objection raised to any general limitation of the number of cruisers in accordance with the capital ship ratios. At the opening of the Washington Conference, Mr. Hughes had said that " capital ship tonnage should be used as the measurement of the strength of Navies, and that a proportionate allowance of auxiliary combatant craft should be prescribed." These auxiliary fighting craft he divided thus:—(1) Surface craft, such as cruisers, flotilla-leaders, destroyers, and other vessels; (2) submarines; and (3) aircraft carriers. The British Empire, with its world-wide responsibilities, could not, however, conform, as Lord Balfour explained, to a rule which would reduce its means of defending widespread and vital interests. The idea of reducing the fighting strength of the nations in all classes of vessels still persisted, and has caused a certain demand for a Treaty to remedy the defects of the Limitation of Navies Treaty. Another cause of disappointment, and even alarm, in the United States, was the suggestion that the work of modernising the British Navy had begun, and that the range of guns was being increased by giving greater elevation. High naval officers, it was stated, declared that the 5—5—3 ratio, the foundation of the Treaty, would be utterly destroyed unless the United States modernised its own Fleet. Congress, therefore, in January 1923, voted 6,500,000 dollars (£1,300,000) to enable the United States to begin this work; but, in June, it was announced that the United States Navy Department had been misinformed as to changes in the British Navy, and that the money voted would not be expended until Congress had had another opportunity of expressing its views. Some reference to this subject will be found below.

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* The New Jersey and Virginia were allotted for aerial bombing practice in September, the Navy manœuvring the ships and the Army conducting the bombing.

There arose in the United States, in course of a few months, a fear that the United States would suffer from the lead which had been given at the Conference. Captain D. W. Knox, U.S.A., wrote a book entitled "The Eclipse of American Sea Power," to which wide circulation was given in the American Fleet, and Mr. Denby himself expressed a kind of admiring and wondering regret when speaking at the banquet of the American Navy League. He said:—

> The history of the Navy in time of peace is an epic which some day will be sung or written, and which, if properly expounded, will make us wonder, as we read it in the future, how it could be that the American people ever thought of crippling this great right arm of diplomacy, this great protection of our people everywhere, the visible first line of defence, this service to which men cling, though material advancement tempts them elsewhere, because of their love for the service, and, under all and over all, their love for the United States.

When at length France ratified the Treaty, there was no hesitation in giving effect to the scrapping policy it prescribed. The Acting Naval Secretary in Mr. Coolidge's Administration gave instructions, in August 1923, that 24 battleships and 4 battle-cruisers should be scrapped. Of the battleships, 17 had long been in the second line. The Illinois, Oregon, Maine and Missouri had already been removed from the list. The number is made up by 6 of the Connecticut class, 5 of the Georgia class, and the Michigan and South Carolina. The battleships of the 1916 programme to be scrapped were the South Dakota and 5 of her class (Massachusetts, Iowa, North Carolina, Montana and Indiana), and the Washington of the Maryland class.

Of the 6 battle-cruisers of the 1916 programme, the Constellation, Ranger, Constitution and United States, being in early stages, will be scrapped, while the Lexington and Saratoga will be converted into aircraft carriers, under the terms of the Treaty. Thus is completed the number of 28 ships to be scrapped.

AMERICAN NAVAL POLICY.

Many points and indications of clear policy resulting from the Treaty gave satisfaction in official circles. The General Navy Board had expressed its unfaltering faith in the battleship, which was the fighting element chiefly concerned. In his latest report, as Secretary of the Navy, dated November 15, 1922, Mr. Denby referred to the new circumstances in which the Navy and Congress found themselves in regard to policy. For the first time in history, there was a definite outlook, and a standard of building and maintenance to be worked to, and it was a standard, he said, proportionate to the position of the United States as a World Power. Thus an end was put to the lack of definitely enunciated purposes, and all that remained was to determine and develop on broad lines the new policy to be pursued.

To this end, the General Board, an advisory authority, though exercising great influence in dealing with large questions submitted to it, was asked to formulate its views, which it did upon the basis of the simple and elementary propositions stated as follows: "The Navy of the United States should be maintained in sufficient strength to support its policies and its commerce, and to guard its continental and overseas possessions." Upon this the general plan was formulated: "To create, maintain and operate a Navy second to none and in conformity with the ratios for capital ships established by the Treaty for the Limitation of Naval Armaments."

On this point of the ratios the then Secretary made a very important observation. He said that it was necessary to adopt a general policy as to strength, which would conform with the agreement, and that, though the ratios adopted applied specifically only to capital ships and plane-carriers, his Department considered it to be the intention of the members of the Conference that the ratio 5—5—3 should apply to the relative total strengths of the Navies concerned. Textually, however, as he admitted, the first Treaty of Washington was concerned only with numbers and total and individual tonnage displacements of capital ships, the total tonnage of aircraft carriers, and the maximum standard displacement of individual cruisers, with restrictions of the calibres of guns in these several classes. But, he suggested, the Conference had designed to carry the limiting effects much further in the spirit of what Mr. Hughes had said at the opening meeting.

In the Navy Appropriation Account for the year ending June 30, 1924, under the heading of "Increase of the Navy," as has been indicated above, a further measure of limitation was proposed, but no practical effect has yet been given to the proposal.

With regard to the policy outlined by the General Board, the

Secretary set only one limit. There would be no departure from the idea of suspended competition in naval armaments, unless or until other Powers made any departure, and in such case it would "be necessary, appropriately, to readjust our Naval policy."

THE NAVAL AIR SERVICE.

Last year a sum of $14,000,000 (£2,800,000) was devoted to the air service of the Fleet, which under Rear-Admiral Moffatt, Chief of the Bureau of Aeronautics, is making great progress. In the airship division, Zeppelins are being added. Z.R.1, the first rigid airship built in the States, has made successful trials, and is to be joined by another Zeppelin built at Friedrichshaven. Z.R.1 is intended to visit the North Pole. In the elaboration of the plans recommended by the Navy Board and adopted by the Secretary, the Naval Air Service was placed in the forefront. Much importance is attached to that part of the Service that is operating, or is to operate, from on board the ships of the Fleet. The General Board has declared that "the battleship remains at present the backbone of services afloat." Yet "the tremendous importance of the new weapon, the airplane, is clear." Accordingly the Army and Navy Joint Board proposes to ask for large additions. The plan is to provide for rapid expansion on mobilisation, and a nucleus is to be created. No air stations will be provided in the excluded Treaty zone, but they are planned at Sand Point, Wash., Lakehurst, N.J., Chatham, Mass., and a naval flying ground at Quantico, Va.

Contrary to the practice in Great Britain, the Air Service is an integral part of the American Navy, and works under the Chief of Naval Operations. It holds a large place in exercises and manœuvres. The successful trials of the catapult have opened a new field for the flying of machines from battleships, cruisers, and possibly smaller craft. Naval aircraft operating with the Fleet have been the F.5L. flying boats, but they are being replaced by pontoon 'planes, which will be greater weight-carriers and can be launched from ships. The active fleet manœuvres planned for the early months of 1922 had to be abandoned on account of lack of fuel, but in August 1923 there were manœuvres in which the Air Service took a prominent part. The Scouting Fleet in the Atlantic, comprising 4 battleships, Wyoming flagship, some 20 destroyers, 20 submarines, minelayers and auxiliaries, was engaged in Narragansett Bay and along the coast in association with its own aircraft squadrons, including about 36 scouting, bombing, and torpedo 'planes, operating from and supported by the seaplane-carrier Wright, which was the flagship of the mobilised air service.

NAVAL BASES.

The prominence given to the Naval Air Service in the plans of the Navy Board adopted by the Secretary was significant. Hardly less so was that attached to the dockyards and stations.

A very important part of the policy proposed and adopted was always to have in mind that a system of outlying naval and commercial bases, suitably distributed, developed and defended, was one of the most important elements of national strength. The comment of the Secretary was that the policy indicated should be accomplished as soon as was consistent with the economic situation of the country. Important work has now been completed at the New York and Charleston Yards and at Guantanamo Bay, Cuba, but the Pacific stations are inadequate to the larger needs, resulting from the new distribution of the Fleet. There are considerable projects at Puget Sound, Mare Island, and San Diego. The most important work now in hand, under the votes of 1923–24, is at Pearl Harbour, Hawaii, where an additional pier is being built at the submarine base, and dredging is in progress. There, also, greater protection is being provided at the ammunition depôts, and the filling and other facilities are being increased. The station is being given an increased water supply, and the ships' and mine storage spaces are being enlarged.*

Rear-Admiral L. M. Gregory visited the bases in the summer of 1923, and reported that in the Pacific the Fleet could not deliver its most powerful blow, having "not one station that meets its requirements." He proposes extensive work in the Hawaiian Islands and the Canal zone, including dredging and channel improvements in the island of Oahu; also a dry dock of the largest size, and new berthing and repair facilities at Puget Sound (£4,721,000); additions at San Diego (£3,420,000); operating, supply, and docking facilities on San Francisco Bay (£5,306,000); better facilities for destroyers and submarines at Chesapeake Bay; and much minor work elsewhere. Ultimately Hawaii will absorb the principal sum (£8,505,600) of the total expenditure indicated below. In order to promote these plans, in August 1923, the Acting-Secretary of the Navy under Mr. Coolidge's administration approved a twenty years' programme for improving the naval bases, The total outlay is estimated at over £31,380,000, of which £1,380,000 will be expended during the coming year. Pearl Harbour will receive $2,000,000 (£400,000), and there will be improvements in the Philippines, Guam, and Samoa, being maintenance work within the Treaty zone.

NAVAL EXPENDITURE.

The Naval Appropriation Bill, 1923–24, passed the House as reported by the Naval Sub-Committee, and went through the Senate with few changes and none of importance. The Act carries the recommendation for further reduction of armaments, which is referred to above. The votes amounted to a total sum of $325,000,000 (£69,550,000). The enlisted strength remains at 86,000, though an attempt was made to secure a reduction to 67,000 on the ground that the figure was unnecessarily large and out of proportion with the British numbers.

The most significant feature of the discussion on the Bill was the request made of Congress by the President for an appropriation of $6,500,000 (£1,300,000) as a first instalment for the battleship

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* The mine storage building will be at the ammunition depôt at Kuahoa, and will have loading platforms, fireproof doors, and railway siding accommodation.

"modernisation" programme. This matter is referred to above, but the circumstances are important. Accompanying Mr. Harding's recommendation was a letter from the Secretary of the Navy, describing the plan as of "major and vital importance" for national defence. He said that work of this sort had been begun in British yards during the war, and that a provision permitting its completion was included in the Washington Treaty if no more than 3,000 tons were added to the displacement of any vessel. It was under this provision that the United States Navy Department desired to act. The idea was to increase the range to at least 24,000 yards, whereas it was said that British guns would range up to 30,000 yards, and many officers wished to know why large sums were to be spent on old vessels which would be inferior after all.

Mr. Denby reported that the vote would permit work to begin on thirteen vessels, and that the programme would ultimately cost $30,000,000 (£6,480,000). It was understood that the 14-in. gun ships would be given deck protection against torpedo attack, and that the batteries would be "modernised" in order that they might take advantage of the extended range of action made possible by the development of aircraft spotting. There would be transferred to these older vessels devices which would have been used in the uncompleted ships which were to be scrapped under the terms of the Treaty. It was not thought likely that any of the 12-in. gun ships —of which there are six—would be affected by the modernisation of the programme, since they were not regarded as forming part of the first line.

SHIPBUILDING PROGRAMME.

No new naval construction is immediately to be undertaken. The battleships Colorado and West Virginia (Maryland class), which were completed in conformity with the Treaty of Washington, were ready in the autumn of 1923. They have replaced the Delaware and North Dakota, scheduled to be scrapped under the main Treaty. Four battle-cruisers of the 1916 programme are being scrapped, but the Lexington and Saratoga are being converted into aircraft carriers, with complete equipment of aircraft and aircraft accessories in accordance with the provisions of the Treaty, and further sums are voted for the work in the Naval Appropriation Act, 1923-24. The last of the ten light cruisers of the Omaha class, 8,500 tons, will be completed in 1924. These vessels have, in some cases, exceeded their trial speeds, and are to make long cruises before joining the Fleet. Each of them will carry two seaplanes to be started from catapults, and will be able to discharge 200 mines when going at full speed. Of the destroyers, the Trever, Perry, and Decatur, last of the class, were completed at the Mare Island Navy Yard in 1922, and no others are in hand.* In the submarine list, 12 of the "S" class were completed in 1922, 24 of the same class were down for completion in 1923, and 3 fleet submarines of the "V" class in 1924.

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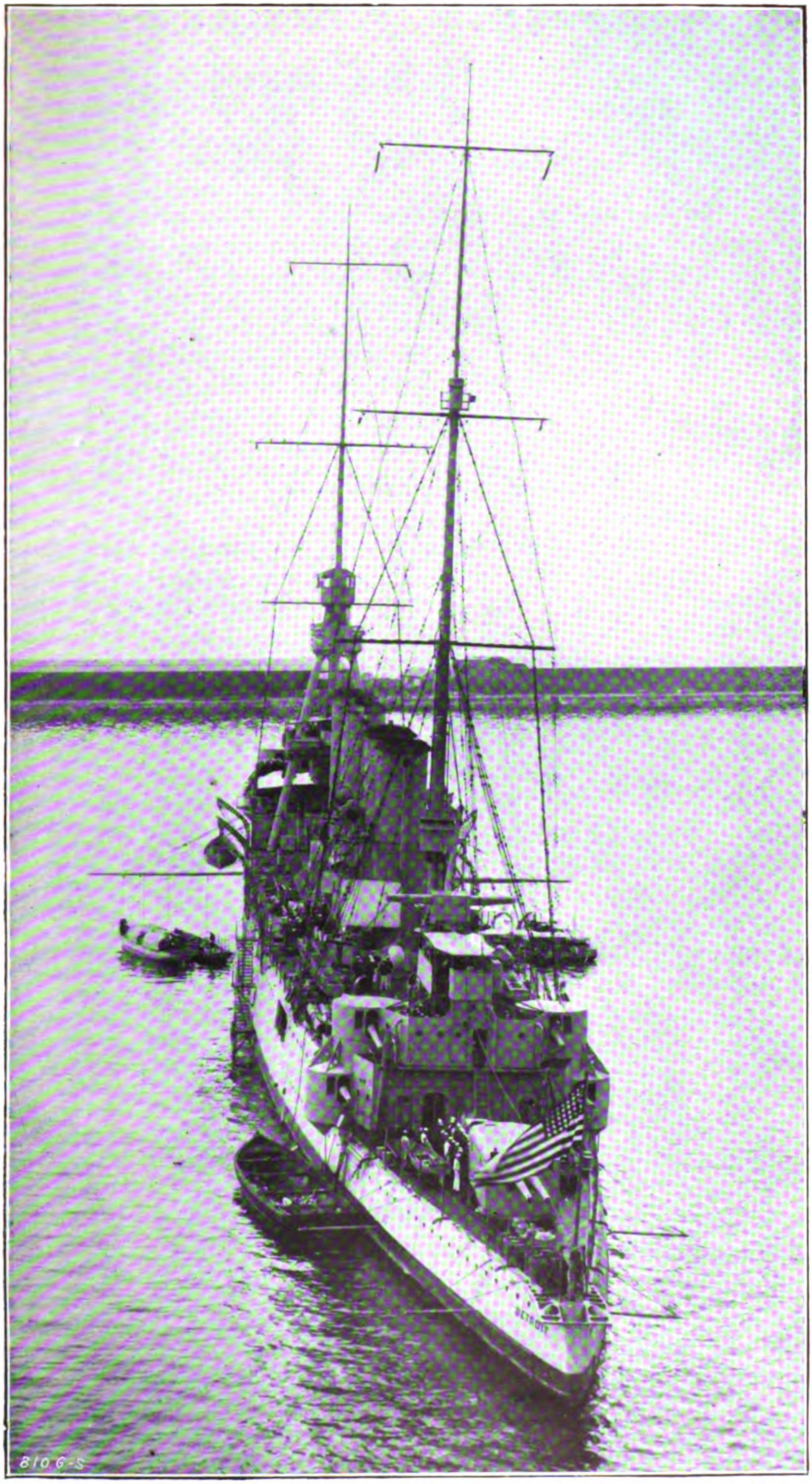
* Seven of the modern destroyers ran on the rocks, with serious loss of vessels and lives, in the Santa Barbara Channel, California, on September 9, 1923, during manœuvres, when steaming at 20 knots in fog and heavy tide.



UNITED STATES SCOUT-CRUISER DETROIT.

(For particulars see pp. 458 and 525.)

With regard to the future shipbuilding programme, Mr. Denby said that, having in mind the financial condition of the country, it was not his intention to recommend any additions, and no new shipbuilding is provided for in the Appropriation Act, 1923–24. But he added that, as soon as conditions warranted, Congress should be asked for such additions as would "tend to balance our Fleet, and keep it the equal of any in the world." He was supported in this view by Admiral Coontz, then Chief of Operations, who reiterated that there was a prevailing opinion in the States that the 5—5—3 ratio applied to navies as a whole, and added: "This is far from correct, and the United States Navy is still far short of other powers in light cruisers, and will still be short after completion of the present building programme—and has no battle-cruisers."

As far as capital ships are concerned, no American vessels could be laid down during the year 1923–24, nor during the period of the ten-year naval holiday, provided the Washington Treaty became effective. But in other types of vessels, which might be built without limitation as to numbers, it was felt by the Navy Department—and the feeling was general among naval officers—that the American Navy was, and would continue to be, at a disadvantage unless something were done. On this point Mr. Denby stated that it was his duty to report that in certain types, such as fast cruisers, aircraft-carriers, seagoing submarines, and aircraft, the Navy was deficient. A later statement of the intentions of the Navy Department was made in June. Mr. Denby said that the naval programme which Congress would be asked to approve for the year 1924–25, would consist of 15 ships, including 8 cruisers, 4 gunboats for the Chinese river patrol, and 3 cruiser-submarines. The critical conditions in China and the extensive trade affected by them were considered, he affirmed, to be imperative reasons for the provision of effective river boats. In the case of the cruisers, the constructors would be instructed to achieve the highest efficiency possible within the limit of 10,000 tons. The plans for the submarines were not disclosed. Three mine-laying submarines are also proposed.

A feature of the Secretary's last report was his statement that, during the previous year, the work of the Navy has been seriously affected by lack of fuel resulting from the Congressional reduction of the appropriation for this purpose, and that the reduction of enlisted personnel to 86,000 "seriously interfered with the operations of the Fleet." So serious became the shortage of coal based on the sum arbitrarily fixed that it became absolutely necessary to appropriate 25 per cent. additional coal as a deficit. Yet there was some advantage. Admiral Coontz reported that the shortage had afforded a valuable lesson in fuel economy.

Fleet Reorganisation.

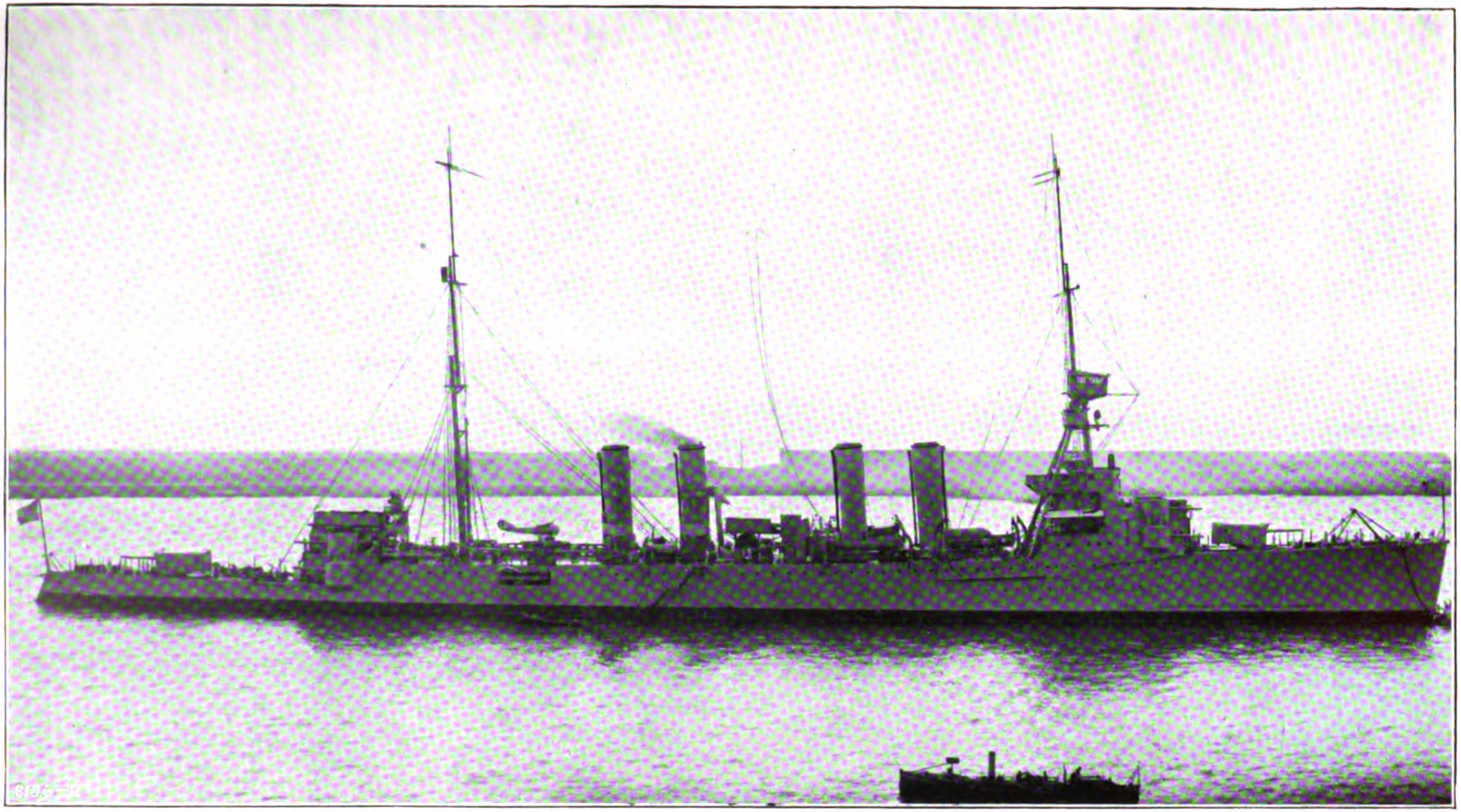
In January 1923, full details were announced of an important reorganisation of the United States Fleet. The War Plans Division in the Department of Operations, had been examining the strategic situation, with relation to which Admiral Coontz stated that it had been guided by the fundamental principle that all major activities should be based on strategic plans, from which have been developed "base projects, organisation of fleets, logistic plans, and expeditionary plans." The plans for the eventuality of possible war in the Pacific have been developed on these lines. When in July 1919, following the return of the ships from Europe, the Navy department decided to create a Pacific Fleet of approximately equal strength to the Atlantic Fleet, and to draft to it the latest types of oil-burning ships, it was understood that this was the first step towards the placing of the main Fleet in the Pacific, and the eventual assembly of the whole Fleet there. This policy has now dictated the consolidation of the Atlantic and Pacific forces in the "United States Fleet," under a single flag officer, Admiral Hilary P. Jones, with his flag in the Maryland.

The battle fleet is commanded by Vice-Admiral Eberle. It had been the rule that, whenever the two fleets met for combined exercises, the Commander-in-Chief of the Atlantic ships assumed command of the whole. This arrangement is now permanent, and presumably the intention is to keep the Fleet united as a general rule and not merely on special occasions, though at present normally, the Fleet flagship and the Battle Fleet of three divisions, with 6 squadrons of destroyers and 4 divisions of submarines, are in the Pacific, while 2 older type battle divisions, with 6 squadrons of destroyers and 9 divisions of submarines, are in the Atlantic.

There will be no change in the assignment of ships or personnel under the new system, which is to facilitate "passing from peace to war conditions, thereby saving time at the beginning of a war when time is vital."

The Fleet, under the new plan, consists of a Battle Fleet composed of the main fighting strength of the Navy; a Scouting Fleet, to move in advance and on the wings of the Battle Fleet; a Control Force, to exercise control of the sea after this has been secured by the action of the Battle Fleet; and a Fleet Base Force, which will support the operations of the fighting units. The entire organisation for purposes of administration in peace or war will be under the command of a single officer with the rank of Admiral, no matter how scattered the elements may be. This will create, in the opinion of the Navy Department, an organised fighting force which has only to be expanded in an emergency to be ready for any campaign.

In February and March 1923, for a period of six weeks, the whole of the available forces in Atlantic and Pacific waters were concentrated for joint manœuvres in Panama Bay, this being the first assembly after the reorganisation. Admiral Hilary P. Jones had with him about 18 battleships and 120 other units of all kinds. The programme included competitions at Panama between the Battle Fleet unit and the Scouting Fleet unit. It was expected that a Congressional delegation of the two Naval Committees would witness part of the manœuvres. One of the problems worked out was a test of the defences of the Panama Canal. This was executed in conjunction with the military forces in the Canal zone, and the plan was drawn up by a joint Army and Navy Board. The August



UNITED STATES SCOUT-CRUISER MILWAUKEE.

(For particulars see pp. 459 and 525.)

manœuvres referred to above were mainly concerned with the Air Service.

The shortage of coal which has affected the mobility of the Fleet, like the shortage of personnel which it has been stated has hampered its work, and the obvious need of provision for navigation in the immense areas of the Pacific, has impressed upon the naval authorities the necessity of seeking wider material resources, and accordingly the late President Harding, by Executive order in February, set aside as oil reserve for the Navy 35,000 square miles in North-Western Alaska. The district lies within the Arctic Circle, and is bounded on the north-west by the Arctic Ocean, and on the east and south by the Endicott Mountains and Colville River. Seepages of oil have been found all along the sea-coast for years, but it is not known what possibilities there are of developing the oil supply. Fifty private investigators are being allowed to exploit a tract of 125,000 acres.

THE PERSONNEL.

As is now well known, it is the Bureau of Navigation which is charged in the United States Navy with all matters affecting the supply, discharges, education, administration, and discipline of the personnel. To this department has fallen the task of bringing down the officers and men to the reduced peace basis. It will illustrate the difficulty of the task to note that the Reserve Force on June 30, 1922, had been reduced within a year from 26,376 officers and 203,606 men, to 5,389 officers and 10,966 men. The enlisted personnel had to be reduced from 115,000 to 106,000, and then to 86,000, at which the establishment still stands. There was consequently some dislocation of the Services, and the training ashore was reduced. Money was not voted adequate to the numbers estimated to be maintained, and there were large numbers of discharges, while enlistment was, of course, stopped. Of the men discharged, many of the better class went to build up the Fleet Naval Reserve. The ships now in full commission are slightly below their war complement, and those in reduced commission have only about 50 per cent. of their normal complement.

The officer personnel reached its normal basis on June 30, 1922, a reduction of about 11 per cent., and since then there has been strenuous work. Examinations for promotion of all officers below the rank of captain are now conducted by supervising boards, all the questions being prepared by and sent out from the Naval Examining Board at Washington. Probably more written examinations have been held since 1922 than in any period of the history of the United States Navy. The officers have not been cut down in anything like the same degree as the men. The importance of maintaining a large body of trained officers is fully recognised. A considerable number of officers were required to take up the duties which had been performed by reserve officers, now discharged, and several hundreds of ex-temporary officers have been given permanent commissions.

The plan is to maintain the personnel in strength adequate for the ratios for ships. The Reserve is to be trained and organised for mobilisation, as a part of the Navy. Mr. Denby insisted that there must be comradeship and co-ordination between the two branches. Restriction of knowledge was discouraged.

PROPOSED SINGLE DEFENCE ORGANISATION.

Questions of large organisation of the defensive forces of the United States have latterly occupied the attention of the Government, and a plan for combining the War and Navy Departments has been under consideration by a joint committee of Congress, recommended to it by the President and Cabinet. It appeared to be thought that the United States, being in a geographical situation of independence, untroubled by such complications as affect the policy of the Great Powers of Europe, might find some advantage in a concentration of authority. The plan under examination was part of a larger scheme for the "Reorganisation of the Executive Departments." The late President Harding gave an outline to the Joint Committee of the reorganisation favoured by himself and his Cabinet. The changes, with few exceptions, notably that of co-ordinating all agencies of national defence, had the sanction of the Cabinet, but the proposals were restricted in scope, and it yet seems doubtful whether, in the face of opposition, the national defence can be proceeded with to the detriment of a larger scheme.

The outstanding recommendations as to the control of naval and military affairs included: (1) the co-ordination of the military and naval establishments under a single Cabinet officer, as the Department of National Defence; (2) the transfer of all non-military functions from the War and Navy Departments to civilian departments, chiefly those of the Interior and Commerce. It was proposed to transfer the Bureau of Insular Affairs from the War Department to the Department of State, and the Coastguard from the Treasury Department to that of Commerce.

The organisation of the proposed Department of Defence, under a Secretary of Defence, provided severally for the Navy and the Army an Under-Secretary and an Assistant Secretary. No separate Air Force exists or was proposed, nor was provision included in the scheme for giving the air arm equal status with the Navy and Army in the Department of Defence. On the Navy side, the existing Bureaux would be maintained. The administration of the Panama Canal would remain under the Army. A new feature was the appointment of an Under-Secretary for National Resources, with an Assistant-Secretary charged with business connected with men, munitions, food, and clothing, transportation, communications, fuel, and miscellaneous needs. Provision was also intended for an independent "National Advisory Committee for Aeronautics." The Under-Secretary for National Resources would thus be at the head of the supply and transport services of both forces.

The plan does not seem to have found favour in the American Navy, on the ground chiefly that the readiness of the Navy might be linked with the unreadiness of the Army, and that the proposed plan is awkward and uneconomical, because it maintains in practice the existing organisation, imposing upon it a dual and expensive control, and creating a new Department which would deprive it of grave responsibility, and deprive it also of authority over the most important means of its operations.

JAPAN.

The unparalleled calamity which fell upon Japan in the earthquake of September 1, evoked the sympathy of the world, as the courage with which the disaster was faced and the credit of the country was upheld aroused its admiration. To the naval mind, and to the mind that knows what the triumphs accomplished in the naval sphere are, the practical destruction of the great dockyard and naval base at Yokosuka, with great loss of life and property, appeared peculiarly sad. At Yokosuka many of the battleships and larger vessels of the Japanese Navy, including the Mutsu, have been built, and, as the Japanese Portsmouth, it was the base to which the Fleet, or a large part of it, returned for reconstruction, repair, refitting, oil, coal, and other supplies. It was by a stroke of good fortune, to compensate, in a measure, for disaster, that no ship of the modern fleet was destroyed. Such as perished were mainly auxiliaries and vessels of no value already condemned. The greatest loss was the destruction of about half of the vast oil stores at Yokosuka. The following account of the Japanese Navy was written before the catastrophe, and it represents the outlook of that Navy and of the Japanese nation as it was, and as it mainly must be to-day and to-morrow.

The Japanese Government has very loyally observed the Washington Treaty, not only in the letter, but also in the spirit. After the Conference, the Mutsu was completed in circumstances explained in the "Annual" last year, but the great shipbuilding programme was at once arrested, and the battleships Kaga and Tosa, of 40,600 tons, each of which was to have carried eight 16-in. guns, and had been advanced 80 per cent. towards completion, were ordered to be made ready for target practice, prior to being broken up respectively at Yokosuka and Kure. The battle-cruisers Atago and Takao, which were in an early stage (15 per cent. completed), were stopped, and they will not be completed. It was directed that the sister battle-cruisers Amagi and Akagi (the former at Yokosuka), 42,000 tons, and 170,000 H.P., which were to have mounted severally ten 16-in. guns, and had been completed up to 80 per cent., should be converted into aircraft carriers under the Washington Treaty, Art. IX., by which it is prescribed that the standard displacement shall not exceed 33,000 tons. All the ships to be scrapped were relegated to the reserve and prepared for demolition. They included the battleships Aki, Satsuma, Settsu, Kashima, and Katori, and the armoured cruisers, rated as battle-cruisers, Ibuki, Kurama, and Ikoma.

A very difficult task fell to Admiral T. Takarabe, Minister of Marine, and the naval staff in making the reductions without completely dislocating the service. The Fleet organisation is now normally as follows:—Vice-Admiral I. Takeshita commands the First

Fleet, which comprises a battle squadron (Nagato, flag, Mutsu, Ise and Hyuga), a cruiser squadron of 3 vessels, 4 torpedo flotillas (15 destroyers in all) with a leader, and a submarine squadron of 5 boats in two flotillas. The Second Fleet is commanded by Vice-Admiral H. Kato, and comprises a battle squadron (Kongo, flag, Hiyei, and Kirishima), a cruiser squadron of 3 vessels, 2 torpedo flotillas (7 destroyers in all), and a submarine squadron of 6 boats. In addition is a foreign-service cruiser squadron of 6 vessels. At the naval stations are ships in reserve, defensive flotillas of destroyers and submarines and other vessels.

REDUCTIONS.

Owing to the scrapping of capitals ships and to other disarmament arrangements, there was a surplus of officers and men, amounting to about 12,000. Retirement and discharge proceeded rapidly and recently 500 officers have returned to civil life. The numbers to be put "on the beach" were completed by 500 officers, officially described as having been for special service, and 11,000 men. The stoppages of all arrangements for the carrying out of the eight-eight plan, seriously affected the dockyards also, and the discharge of workmen, owing to the diminishing work, proceeded. Twelve months ago, 6,000 men had already been discharged, and the reduction has since proceeded rapidly. The grand manœuvres planned for 1922 were not held, and even minor manœuvres were suppressed, in order, it was announced, to respect the spirit of the Washington Treaty. Plans for manœuvres in 1923 were drawn up.

Proposals for the re-organisation of the naval ports and naval bases to meet the reduction of armaments and expenditure were introduced, and affected several of the establishments, but no reduction had been made at Yokosuka. Maidzuru, on April 1, was reduced to the status of a naval base instead of being a naval port, and all the offices and works were made commensurate with the needs of the base, the naval station, personnel office, office of accounts and supplies (excepting sections of the victualling and clothing departments), naval civil engineering department, prison, law court, and barracks being all abolished. At the same time, a minor naval station was created, with dockyard, harbour-master's office, hospital and the victualling and clothing sections. The Naval Defence Corps and wireless station were not affected. Chinkai naval port became a naval base, and Port Arthur ceased to exist as a base, but the Naval Defence Corps and naval wireless station remained unaltered. Takeshiki and Eiko naval bases have been abolished, and the naval recruiting area has been divided into three districts instead of five.

NAVAL POLICY.

Such, briefly, is the effect which has been exercised by the Washington Treaty upon the Japanese Navy. As was remarked in the "Annual" last year, the Japanese naval problem has been simplified in some degree by the restriction of foreign approaches, through the prohibition of new naval bases east of the meridian of 110° E. longitude. It has been suggested in some quarters that the development of Singapore as a British base, strictly in conformity as it is with the Treaty, would give offence to Japan. This was due to misunderstanding. Japan and the other Powers represented at Washington knew well that the development of Singapore was intended, as Admiral Takarabe has testified, and that the limiting parallel of longtitude was intentionally placed east of the new British base. The Japanese, indeed, are well aware that a Fleet needs a base, and that the Pacific is the ocean of the future, and its gateway, east and west, a matter of peculiar importance to the British Empire. Count Uchida, Foreign Minister, in the course of an interview in July, said Japan had no understanding with England on the Singapore scheme, which, be added, was outside the limitations of the Treaty, and Japan could take no exception.

The Japanese national problem is not simple. The population of the main islands has been steadily increasing, and at the present time there are about 360 inhabitants to the square mile, although only some 16 per cent. of the land is available for cultivation. The Japanese have studied the British remedy for over-population, and doubtless feel it a serious disadvantage that they have no overseas territories to welcome their emigrants. Some observers think the time cannot be far distant when it may become impossible for the whole male population to find work or wages in the country. Taiwan (Formosa) and Hokoto (the Pescadores) were ceded by China in 1895, Port Arthur and other territories by Russia in 1905, and Korea was annexed in 1910. Korea served as a limited field for exploitation, though not for settlement, there being a sufficient population already in that country. Korea is also unsatisfactory, because the climate is severe. The country, however, has strategic and commercial value as a connecting-link with Southern Manchuria and the northern provinces of China. The Japanese have accordingly developed the railways of that country. Formosa can absorb very little more immigration, since the interior consists almost entirely of mountains and forests still inhabited by primitive tribes, while the tea and camphor industries are already well developed by Formosa labour, and by the Chinese from the mainland. The chief advantage of the possession of this island to the Japanese is in its relations to the Philippines, Hong Kong, and the Chinese province of Fukien.

The lesser Japanese islands, such as the Carolines or Marshalls, or those in the chain between Formosa and Japan herself, are of little use for immigration. Japan looks also across the Pacific and southward to Australia, but finds everywhere a barrier to her emigrants. Her people have realised their disadvantages, and are asking why the sea that separates them from the mainland of China should prevent them from gradually obtaining control of some parts of that country. China is rich in almost every kind of product necessary for industry, and has a population which is ready to buy large quantities of manufactured goods. Chinese coal, rice, and cotton are much sought by Japan, while China's vast reservoir of labour only awaits organisation to produce goods of all kinds at a very low price. Japan does not see why she should not develop that country.

NAVAL PROGRAMME.

Such are the conditions underlying the naval policy of Japan. The people are pre-eminently seafarers, and, after a seclusion of two centuries, have placed themselves in possession of a Navy which is third in the list of the navies of the world. Though battleships are not being added, those existing are to be altered to meet new conditions. It is understood that they will receive overhead protection. A sum of 50,000,000 yen (£5,000,000) will be devoted to the work, to begin with 2,259,000 yen in 1923–24. It is proposed to complete the scheme in 1931. It is not suprising that Japan is extending her Navy in the direction which is permitted in the final shape given to the Treaty of Washington. She had already in hand a considerable programme of cruiser, destroyer and submarine construction, which is being carried forward. Little construction of this class has been conducted at Yokosuka. Nine light cruisers of the Yura class, of 5,570 tons and 33 knots, carrying a main armament of seven 5·5-in. guns, have been completed, and the sister cruisers Isudzu, Abukama, Naka,* Sendai, Jindzu, and Okuma are progressing, as well as the Yubari, which is smaller (3,100 tons) and carries one gun less. The further programme includes four light cruisers, each of 10,000 tons, and four of about 7,100 tons. Two of the latter class are in hand. The Kako, being built at the Kawasaki yard, Kobe, is reported to be of the 7,100-ton class, as also the Furutaka (Mitsubishi, Nagasaki). The Kinugasa and another complete this series. No particulars are available of the four 10,000-ton cruisers of the programme.

In the destroyer lists, the Kokase, Nokase, Numakase, Namikase and Suzukase (No. 1) have been completed in 1922–23, and seven others are in hand. They are of the large flotilla-leader class, 1,345 tons, 34 knots, four 4·7-in. guns. The Sumire, and Nos. 2, 4, 10, and 16, which are of a smaller class, 850 tons, 31·5 knots, three 4·7-in. guns, have been completed, and Nos. 6, 8, 12, and 18 are progressing. The further destroyer programme includes twenty-four boats of the larger class, of which four are in hand, severally at Maidzuru, the Uraga Dock Company, Ishikawajima (Tokio), and Fujinagata (Osaka).

Of the submarines, the most recent particulars are not available. The list built, or placed for building, included 47 boats, and the further programme numbers 46. The Japanese stated officially in August that 13 were actually in hand. Particulars have been given up to No. 47, launched in 1922. The larger boats are Nos. 14–24 and 34–45, 740–1100 tons, and Nos. 25–30, and 46 and 47, 900–1082 tons, with speeds of 17 and 18 knots. Nos. 31–33 are a little smaller. The later boats, which are of the submarine-cruiser type, are much larger. Some notes are given concerning them in the tables. The latest boat completed appears to be No. 79. The displacement is said to be 2000 tons on the surface, with a range of 17,000 miles, two guns and large torpedo supply and mining gear. There was an explosion in No. 75 in March, and on August 21, No. 27 sank near Awaji Island, 90 officers and men being lost and 5 saved.* This complement implies a submarine of considerable size.

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* The Naka, nearly completed, was damaged in the earthquake, but can be repaired.

Some coastal motor boats have been built for Japan, each to carry two 18-in. torpedoes and light guns.

The Naval Air Service.

With regard to the Air Service, the following are some particulars:—The Civil Aviation Department was under the control of the Minister for War, but not of the Cabinet direct. On April 1 it was placed under the control of the Department of Communications.

The aircraft carrier, the Hohshoh, had been completed and the battle-cruisers Amagi and Akagi were to be converted, as is mentioned above.

There are four Naval Flying Corps—the Yokosuka and Kasumigaura Naval Flying Corps, under the Commander-in-Chief of the Yokosuka Naval Station (Admiral K. Nomaguchi), and the Sasebo and Ohmura Naval Flying Corps, under the Commander-in-Chief of the Sasebo Naval Station (Admiral S. Tochinai).

The naval aircraft factories were at the dockyards at Yokosuka, Kure, and Sasebo. At Yokosuka were 10 F.V. boats, 6 Nieuport Sparrowhawks, and about 50 Yokosuka seaplanes; at Sasebo 24 of the last-named; and at Kasumigaura about 75 Avros and some 75 of other types. Vice-Admiral K. Suzuki is in command at Kure.

The Naval Training Corps for flying is attached to the Kasumigaura Flying Station.

FRANCE.

The outlook of the French Navy is yet uncertain, but a vigorous effort to reorganise it is being made. It has the great advantage of possessing its own Air Service, and, from the French point of view, of operating in association with the coast defences, and of localised clouds of destroyers, submarines, and flying machines. It is no longer almost wholly concentrated in the Mediterranean as it was. Attention is now turned to the English Channel.

An effort is being made to constitute the Navy under an organic law, known as the "Statut Naval," embodying a *projet de loi* for the further organisation of the Naval Air Service (Aéronautique Maritime). A restricted shipbuilding programme was adopted last year, and, after long delays, the Washington Naval Treaties have at last been ratified. The coast defences, as was explained in the last "Annual" (p. 49), are now under the Navy, with the designation of Frontières Maritimes, and this system presents the greater importance because of the five Flying Divisions (*divisions d'aéronautique maritimes*) which are intended to be organised under the new *projet de loi*;

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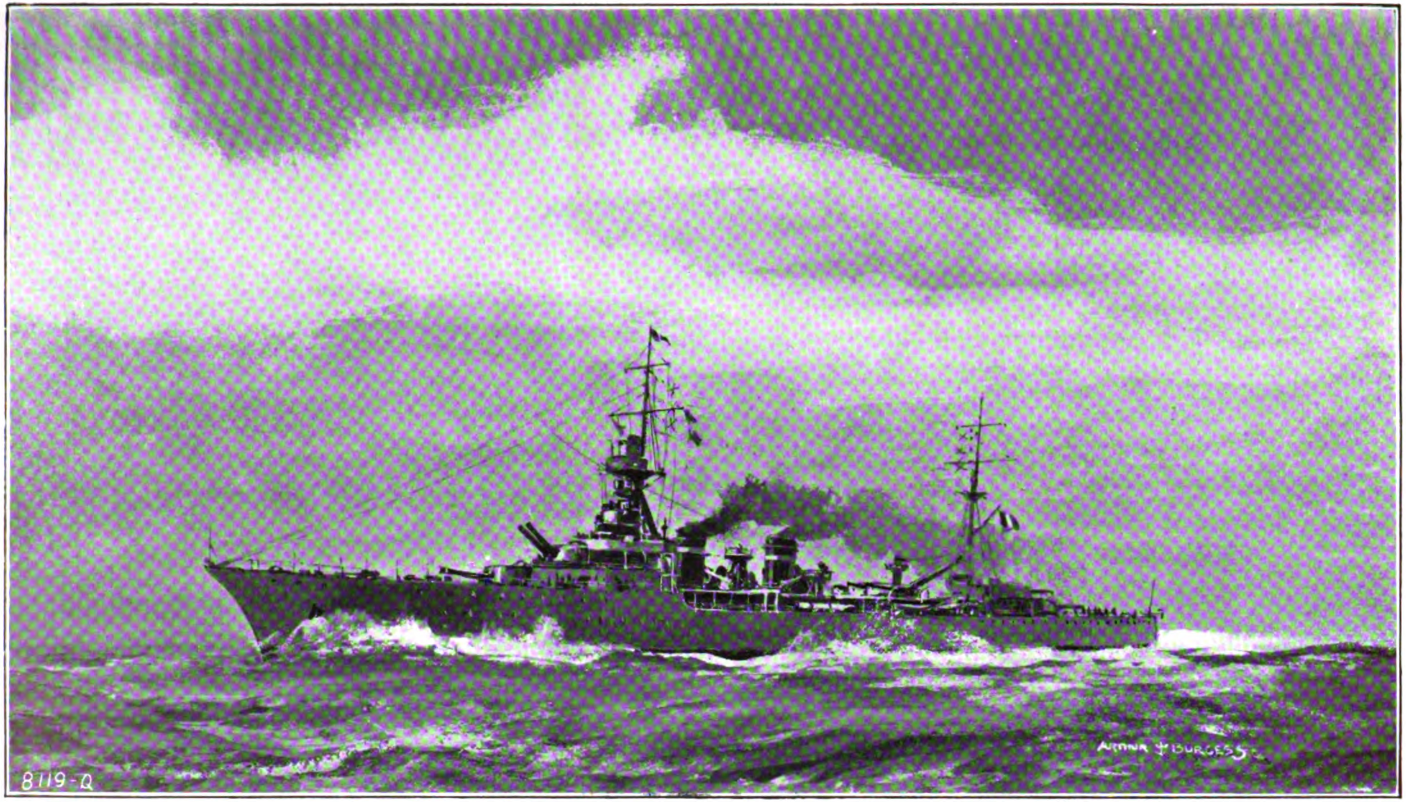
* After the earthquake the salving of the boat was resumed.

four will be attached to these coast defence regions. The actual distribution is in the hands of the Minister. The intense preoccupation in military affairs, the absorption of funds in the calls for the Army, and the great demand for the land Air Service, have withdrawn attention from the Navy, and sufficient money for developments and service has not been available. The long delay in ratifying the Treaties—though they did not affect the French Navy in any essential particular, nor concern the existing capital ships until 1930, nor again restrict the French from replacing the France, which was lost in August 1922, if they were so minded—was a disturbing element in the situation.

France, from the first, was discontented with the relatively inferior position to which she was relegated at Washington. M. Raiberti, Minister of Marine, stated in the Chamber on July 8, 1923, that this inferiority had been accepted owing to the financial situation, and in view of the need of building light vessels. M. Poincaré declared that the relative total tonnages assigned did not represent the respective maritime interests of the Powers, and could in no case be extended to other classes of vessels, and, replying on the point as to what will happen in 1934, when the individual states must determine whether they will denounce the Treaty, proclaimed his view in these words: "The day when France declares that she claims her liberty I defy any one to take it from her." M. Briand, ex-Premier, who was intimately concerned in the negotiation of the Treaties, stated in the Chamber that France kept a free hand in regard to light cruisers, destroyers, and submarines.

The Fleet has recently been maintained upon a reduced basis. Insufficiency of financial credits and want of coal restricted navigation, though there have been manœuvres, and the sea-going training division was suppressed. Of the six Mediterranean battleships, nearly all went into dockyard hands in 1923, and the Paris proceeded to Brest for a long refit. The Mediterranean cruiser division consists of three ex-enemy ships dispersed. The destroyer flotilla was divided, one part being sent to the Levant. With the flag remained the flotilla leader Admiral Sénès and eleven boats. The Levant Division consists of three of the old armoured cruisers, one of which is usually in dockyard hands. There were also in the Levant six submarine chasers, and some went up to Constantinople. Another small force was on the Syrian coast. Patrol, minesweeping, and submarine flotillas were at Toulon, others at Bizerta, and some torpedo boats and gunboats distributed at Corsica, Algeria, Tunis and Oran. The Naval Air Service continues on a reduced footing, though extensive projects are contemplated. Toulon, Ajaccio, and the Kenitra Station north of Rabat were closed down. There are three airships. At St. Raphaël are the pilot school and experimental station, with about twenty training 'planes and eighteen pursuit and scouting 'planes. This air base is to be enlarged, with a large hangar for aeroplanes, and another next year for seaplanes; also designing offices, laboratories, repair shops, oil storage, and railway connection with the main line. The station at Berre, near Marseilles, is in reserve, but there are about twenty training 'planes there. Bizerta has four training 'planes.



(*From a drawing by Arthur J W. Burgess.*)

FRENCH LIGHT CRUISER LA MOTTE PICQUET.

(*For particulars see p. 438.*)

There has been a change in the distribution of the Fleet. Three battleships—the Voltaire, Condorcet, and Diderot—have been brought round to Brest and have four-fifths complements. There are also on the Channel and ocean side, six of the old armoured cruisers, with some sloops. At Cherbourg and Brest and local stations are patrol flotillas, comprising destroyers, despatch vessels, submarine chasers, and submarines; at Lorient and Rochefort minesweepers and chasers. These vessels were tested in manœuvres in July in an attempt to enter the Channel undiscovered by forces of the Frontières Maritimes, which were mobilised from Dunkirk to St. Malo. The Diderot and ten destroyers left Brest, evaded the flotillas in some mist, and landed troops at the St. Valéry-en-Caux. Of aircraft, there are three airships in commission at Rochefort and St. Cyr, and nine, some of which were mobilised, in reserve near Cherbourg and Brest. On the coast at Brest, Cherbourg, and near Bordeaux, were recently about thirty-six seaplanes and aeroplanes.

SHIPBUILDING PROGRAMMES.

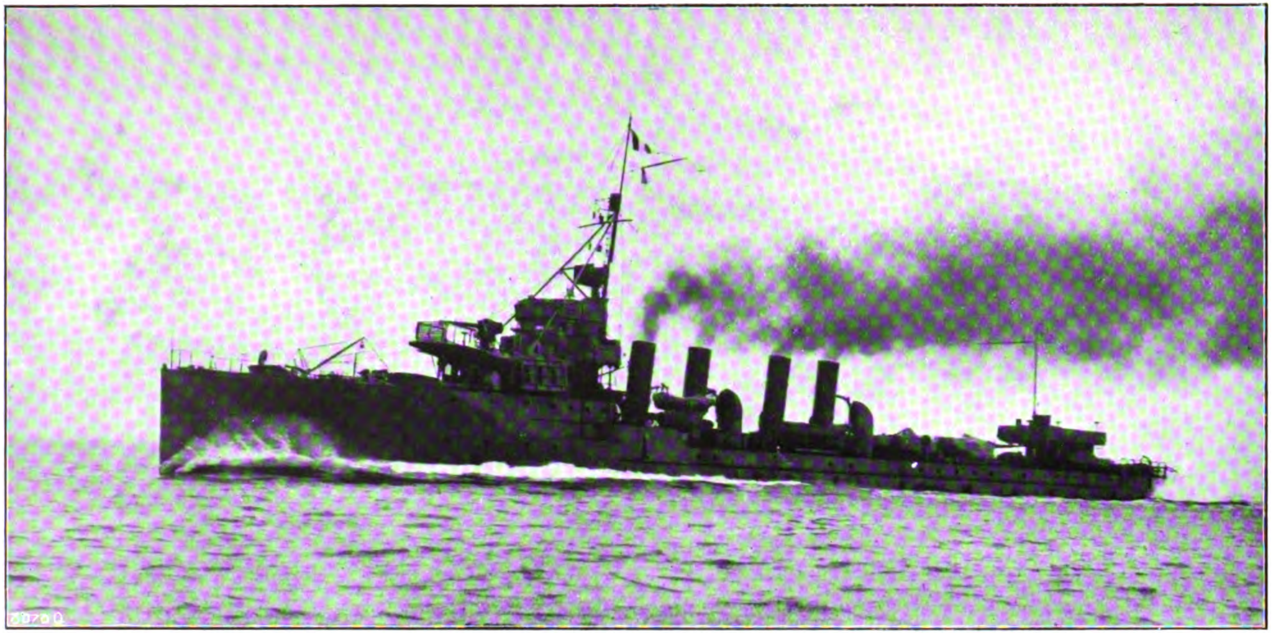
The "Statut Naval" indicates the total displacements of the various classes of vessels to be possessed by France. In the case of battleships and aircraft carriers, these are the terms as fixed by the Treaty, and no construction policy is implied. The building programme described in the last "Annual" (p. 17), is in progress. The three light cruisers, which are named Duguay-Trouin (launched at Brest, August 14), La Motte Picquet, and Primauguet, all names known to the old French Navy, are building, two at Brest and one at Lorient. They are to be of 7,873 tons, and 96,000 H.P., with geared turbines and oil fuel, and a speed of 34 knots, and are to mount eight 6-in. guns in four turrets, and six smaller light and machine guns, and will have twelve torpedo tubes. Each will also carry two seaplanes, as in the American cruisers, to be launched from catapults. The Duguay-Trouin, launched in a year and ten days from the laying of the keel-plate, made a record in French construction. The six flotilla leaders are in hand, two at Lorient and four in private yards. They are to be of 2,362 tons and 18,000 H.P., with geared turbines and oil fuel, and will carry six 4-in. and two 3-in. guns, with six torpedo tubes. They are to be named Jaguar, Panthère, Léopard, Lynx, Chacal, and Tigre. The programme also includes twelve destroyers, now building in private yards, of 1,378 tons and 30,000 H.P., with geared turbines and oil fuel, and an armament of four 4-in. and two 2·3-in. guns, with four torpedo tubes. The programme is completed by twelve submarines, of which four are in hand at Cherbourg, one each at Brest and Toulon, and six in private yards. The torpedo craft are mostly being built to replace many older boats now removed from the lists. No ships or vessels other than those named remain in hand, all previous programmes having been completed, except that the battleship Béarn, launched in 1920, is being converted, under the provisions of the Treaty, into an aircraft carrier, with turbine and reciprocating engines, and coal and oil fuel. The four new submarines, Maurice Callot, Henri Fournier, L. Dupetit-

Thouars and O'Byrne, completed their trials in January and were put into commission. The Paul Chailly, launched in 1922, has since joined them.

NAVAL CONTROVERSY.

An animated controversy has recently centred about the French naval policy, the further programme, and what is known as the Statut Naval—the "constitution et armament de la Flotte Française." The Minister of Marine, who, in August 1923, outlined extensive projects of naval expansion, had said early in the year that the Navy was dying. The *Journal des Débats* took the matter up, and roundly declared that the Navy was not dying, but was already dead. What was really meant was that sufficient money had not been available to keep it in active life, or to replace the obsolescent vessels, or provide for expansion. All forces were tending to the destruction of the Navy. Whenever the Minister of Marine asked for adequate resources, he met with opposition. The Chambers had voted money for what was called a "naval programme," but which was in reality a programme to provide substitutes for vessels already obsolete, while obsolescence was proceeding more rapidly than replacement. In the estimates for the further programme were certain annual charges covering a period of years, amounting in all to 718,000,000 frs. But when the committee examined the scheme, it was discovered that the cost would amount to 100,000,000 frs. more. In the result it was decided that permission could not be given for the inception of a plan which would ultimately lay upon the Treasury a responsibility it had not undertaken to bear. Thus delay occurred. Increased expenditure was, however, inevitable, owing to the higher costs of materials and labour, and the disturbance of the rate of exchange. Moreover, the Minister of Marine had originally asked for considerably larger votes. M. Raiberti's proposals were made early in 1923, just at a time when great demands were being made for the Army, and when the Council of Defence, which is composed of representatives of the military services and of leading industries, manufacturers, bankers, and scientific and technical experts, was advising the Government on questions of duplication of services, and urging great expenditure on the Army Air Service.

A press campaign in favour of a definite naval policy took place in the spring of 1923. The *Matin* was active, and in March and April, under the heading, "Et maintenant une Marine, s'il vous plait!" argued that if a Navy is required, there must be a plan. It pointed out that during the later stages of the war, immense stores of food and war material were imported, and that without seas open to transport, France would have been defeated. On March 23, the *Matin* told its readers that under Louis XV. France lost her fairest colonies because she had a fleet which could "neither defend nor protect them." On the next day, the same paper—approaching its point—said that 175 German submarines had held in check the most powerful maritime coalition the world had ever known, and on March 25, it asked what 175 submarines would now cost France. The policy was presently announced in a series of articles under the



FRENCH TORPEDO-BOAT DESTROYER ENSEIGNE GABOLDE, STEAMING 33·45 KNOTS.

(Built at the Chantiers et Ateliers Augustin Normand, Le Havre.)
(For particulars see p. 469.)

caption: "Des sous-marins et des avions! Des avions et des sous-marins!" As to the surface vessels, they were merchant ships, which must consequently be armed. The late Lord Fisher and Sir Percy Scott were cited in four successive articles in support of such policy, and on April 6, the last-named officer was quoted as saying that the Admiralty lived in the past instead of thinking of the future. The *Matin* added: "Il s'agit, bien entendu, de l'Amirauté britannique!" Thus was France being impelled to turn to the spirit of the old Jeune Ecole, and to build a cloud of small craft instead of mastodons. Reservations on the subject of submarines were made, and a special report was prepared by M. de la Ferronaye.

The further naval programme which led to this controversy, and to so much questioning, was prepared by M. Raiberti, in collaboration with the Superior Council of the Navy, and authorised by the Council of Ministers. It proposes the reconstruction of the French Navy within twenty years, and is to be based on the ratification of the Washington agreements. The number of capital ships allocated to France will not be exceeded, and no battleships will be placed on the stocks before 1932. When the Duguay-Trouin was launched, M. Raiberti implied that the existing battleships would be modernised. In order that they might go to sea they must have "satellites" of light cruisers and other craft. The tonnage proposed by France, and to be included in the "Statut Naval," are for the other types of vessels—light cruisers, torpedo boats, submarines, and seaplane carriers—360,000 metric tons of light vessels, 65,000 tons of submarines, and 60,960 tons of seaplane carriers. In these figures are not included small submarines intended for local coast defence. The following special vessels are also in the plan in addition to the tonnage indicated: one repair ship, two minelayers, two submarine depôt ships, three transports for aeronautical supplies, two net-layers, and various auxiliary vessels.

In the first eight years, being the second part of the programme, six light cruisers, fifteen flotilla leaders, twenty-four destroyers, and thirty-four submarines are to be constructed, as well as two minelayers and four oilers. These vessels are indicated as to be laid down from 1925 to 1930. A credit of 2,400,000,000 frs. (nominally £96,000,000) for this part of the programme will be divided into annuities of 300,000,000 frs. (nominally £12,000,000) to cover the cost of construction during the next eight years. By this method, the Navy is to be maintained and a further increase of credits would be avoided.

M. Raiberti, referring to this programme in August 1923, based it in part on the new Colonial empire—the "new France born across the sea, more vast, more powerful, and more rich in promise than that which nearly two centuries ago, her naval defects had buried in the sea." On the reassembly of the Chamber he would ask for the necessary supplies, and had no doubt that they would be granted.

ADMINISTRATION AND PERSONNEL.

There are no important changes to record in the French Naval Administration. The Works Department (Travaux Hydrauliques) was suppressed in pursuance of a decree of August 1922, and its branches have been separated under other departments. A Works Section has been constituted to take up some of the duties.

In May 1923, more importance was given to the Hydrographic Department, which formerly worked under the Naval Staff. It has now become independent, and at its head is a Vice-Admiral, who is styled Inspector-General of Hydrography.

New proposals are made for a fresh establishment of officers, whose position and prospects are to be investigated. The Chamber has appointed a Reporter on the question, but discussion is deferred. Progressive reductions were made during 1922. The petty officers and seamen have the same strength as in 1922, including 55,000 attributed to the coast defences and the Air Services. The law of April 1, 1923, fixed at eighteen months the military period of obligatory service, and this law is applicable to the men who are embodied in the naval service, but not to the men who are of the coast districts, who come in under the old Inscription Maritime, or men who voluntarily enlist.

THE NAVAL AIR SERVICE.

The proposals for the organisation of the Air Service of the Navy, under the Control of the naval administration, form part of the *projet de loi* in the "Statut Naval." The Flying Service (Aéronautique Maritime) is to comprise: (1) forces which will co-operate with the sea-going fleets, and maintain communications between France and her overseas possessions; (2) other formations which will participate in the coast defences of the Frontières Maritimes; (3) aerial ports and floating bases necessary for the working of these several formations. In time of peace, the Air Service is to comprise 50 flotillas and such dirigibles and captive balloons as the Minister may determine. These forces are to be organised in five divisions, of which one will be attached to the sea-going fleet, and four to the coast defences. The aerial ports necessary for the maintenance and operations of the formations of the Naval Air Service will comprise: (1) a central base; (2) four frontier bases; (3) principal "centres" and training stations. The number of "centres" attached to each "Frontière Maritime" will be fixed by the Minister. The bases will constitute the establishments and services necessary for the air services. The personnel will consist of (1) naval officers who specialise in the air service; (2) warrant officers, petty officers and seamen who are or become specialists in naval aviation, and who come from the general body of the Navy; (3) civilian engineers and workmen. There already exists in the Ministry of Marine a central-flying service, which decides on the types of machines necessary for naval flying under direction of the Minister. The officers of this service are employed in experiment and trial, and the construction of flying material and its maintenance. This central office is also charged with the mobilization of the air service, and the training of the personnel.

In August 1923, what is described as the first French torpedo aeroplane was delivered for the Navy at the Villacoublay aerodrome. This is a Levasseur, with 600 H.P. Renault motor, capable, it is said, of climbing to 9,000 ft. in thirty-five minutes. A torpedo weighing 1,560 lb. is suspended under the fuselage, and the machine and torpedo together weigh 2,394 lb. The aeroplane appears to be intended for the coast service, and to be the first of a series.

In view of the close association which exists between naval and military aviation, it may be suitable here to summarise a few facts concerning the French land service, which, it appears, has now a war reserve of 4,800 machines, with 800 pilots trained every year and recalled to the colours for refresher courses at the rate of 250 yearly, so that 1,000 pilots will be available at the end of five years in addition to the regular establishment, and 1,000 more after further courses. The new establishment is 200 fighting and observation squadrons. In the "U.S.A. Air Service" (January) Major W. L. Brereton, formerly American Air Attaché in Paris, gave instructive information. He said:—

> The plans contemplate that each existing pursuit squadron shall be expanded upon mobilization into three squadrons, and each existing observation and each bombardment squadron into two squadrons. The point of vital importance is that this system exists, and that the *personnel* and material are in readiness to ensure proper operation.
>
> On the outbreak of war the mobilization of the Air Service will be completed first. The functions of the Service in the first stages are:—On mobilization those cadres intended for the nucleus of reserve squadrons will proceed to their depôts. This, it is stated, will not materially diminish the effective strength of units in service, which are at all times ready for action. These units will immediately begin the offensive for the purpose of retarding and crippling the enemy's troop concentrations and observe the progress of his mobilization and the movements of his armies. As part of its initial equipment every machine of whatever type will carry bombs. Assuming that seventy-two hours are required completely to mobilize the Army and thirty-six to mobilize the Air Service, during the second thirty-six hours, the latter, temporarily used as combat aviation, will be employed in harassing the enemy troop concentrations, in preventing penetration of the frontiers of France, and in surveillance of the enemy army. As this covering period, so called, ends with the entry of the Army into the field, the necessary units of the Air Service, already in action, are assigned to the troops, that is, as each army corps takes the field its corps aviation joins it, having already completed several days of active service.

There is such activity in building aircraft for the naval and military services, that the constructors could not find time to organise an aeronautical exhibition in 1923. The naval air stations are referred to above in relation to the distribution of the Fleet.

Coast Defences and Dockyards.

The proposals before the French Chamber extended to many large naval questions, and diligent inquiry was instituted. M. Georges Boussenot, Deputy for Réunion, appointed reporter to the Chamber on the question of the coast defences, made a tour of inspection, which he completed in June at Cherbourg. The purpose was to view the reorganisation of the defence of the French littoral under the new "Statut Naval." The Deputy came to the conclusion that the following measures were necessary for completing the coast defences:—(1) The creation of a strong base for aeroplanes and seaplanes; (2) a powerful mobile defence force of torpedo-boats and submarines; (3) defence by land torpedo-tubes and floating-mines supplemented by submarine chasers; and (4) coast artillery. This scheme, he said, would involve the construction of additional seaplanes, aeroplanes, and submarines.

On the question of the dockyards (*arsenaux*) the Senate made inquiry. These establishments are still a bone of contention between the electoral parties. The Navy long since declared that only two dockyards were required, viz. Brest and Toulon. Local and other interests have so far impeded action, but the Chamber, on the proposition of the Government, adopted a plan tending in the desired direction. When, however, the scheme came before the Senate, that body received a report from M. Lémery, chairman of its committee, wherein that gentleman criticised the text of the measure very severely. After having affirmed that only two dockyards were required, the Chamber, by a strange paradox, proposed, he said, to maintain Cherbourg, and to increase the importance of Lorient. Rochefort, whose difficult channels no longer give protection, is alone to be sacrificed, but here again the Chamber intervened. The Senate report declares that by the very terms of the text, Cherbourg becomes merely a base (*point d'appui*), and can undertake no shipbuilding work for the Navy. Accordingly the shops and building berths must be handed over to private concerns within a period of two years. As to Lorient, the importance of which the Chamber would even increase, M. Lémery thinks the Navy may well continue to use the existing establishments, as it is doing by building a light cruiser and two flotilla leaders there, but only on one condition, that there shall be no increase of expenditure, which would be the case if submarines were to be built there. Only surface vessels should therefore be built at Lorient. The establishment of men in the dockyard—there are more than 4,000—he would cut down by one-half.

M. Lémery has attempted to show mathematically the enormous waste that persists in French dockyards. The French are much attracted by the use of coefficients as a basis for statistical demonstration, and the Senate reporter, taking account of the wasting value of the ships and vessels of the French Navy, assesses the total worth at 925 millions of francs. But if those vessels be struck out which, in the naval opinion of the world, are valueless, there will remain a value of 690 millions. Even this sum includes the obsolete and obsolescent battleships, and if these be struck out of the account, M. Lémery arrives at the conclusion that the value of the French Navy is only 365 millions. At the same time the total of the naval budget is 1,200 millions. Thus is attempted to be shown *le gaspillage le plus condamnable* of the French Navy estimates and expenditure. M. Lémery's conclusion is not that insufficient sums have been voted, but that, instead of being expended on the renewal of the fighting fleet, they have been employed in keeping useless dockyards in operation. He says that in non-productive expenditure—as the central administration, the industrial expenses in the dockyards, costs of maintenance, etc.—25 per cent. of the money voted is absorbed. He claims to demonstrate his point by showing that the dockyards alone, though no vessels were constructed, cost 342,000,000 frs. in 1922, or 35·61 per cent. of the total expenditure. The fault is said to lie with those who have resisted the reform of the dockyards or have sought to diminish the effects of the changes intended. There has been some opposition in the Senate to the conclusion of M. Lémery, apparently on the ground that he attaches too much attention to material things, and not enough to training and the maintenance of a large body of experts in the constructive departments. But it is said that his conclusions will receive effect from the Government, with the approval of M. Raiberti and of the Chief of the Naval Staff, as well as M. Henry Béranger, and the Financial Committee of the Senate.

ITALY.

The reorganisation of the Italian Navy after the war seems now, in a measure, to be complete. The aims, at least, are recognised, and definite steps have been taken towards the attainment of them. The Fleet is kept in a state of efficiency and readiness, as was shown in the action swiftly taken after the murder of the members of the Delimitation Commission. The Fleet is inspired with a full sense of national pride and the need for thoroughness. But economies are necessary, and it is believed they can be attained with greater efficiency. Plans were adopted unanimously by the Council of Ministers on January 15, 1923, and Admiral Thaon di Revel, Minister of Marine, who prepared them, was directed to concert with the Minister of Finance the means for giving effect to them. The Admiral is an officer of long experience in command and administration, and is advised by the Superior Council of the Navy and the Naval General Staff, besides being himself president of a Council of Admirals, whom he can consult at any time.

It is intended, in the first place, to make effective the existing ships, and to secure economy by selling or scrapping ships which were becoming obsolete. This policy is receiving effect. The battleships Giulio Cesare, Conte di Cavour, and Dante Alighieri have undergone partial reconstruction and have had their foremasts removed to positions before their funnels in order to obviate smoke obstruction, and make possible the new system of fire direction and control. The new masts look formidable and are upon a quadripod plan, embodying the conning tower. A number of ships and vessels have been removed from the list. The dockyards are to be placed on a better economic basis. The commands have been reorganised. It is expected that by these and other means savings can be made, and money be expended more wisely. Admiral Thaon di Revel is firmly of the opinion that ships at sea, necessary also for the training of officers and men, deteriorate much less than ships laid up in port. But for a country like Italy, which is dependent on foreign supplies of coal and oil, the difficulties are considerable, and the Admiral knows that they cannot be overcome at once.

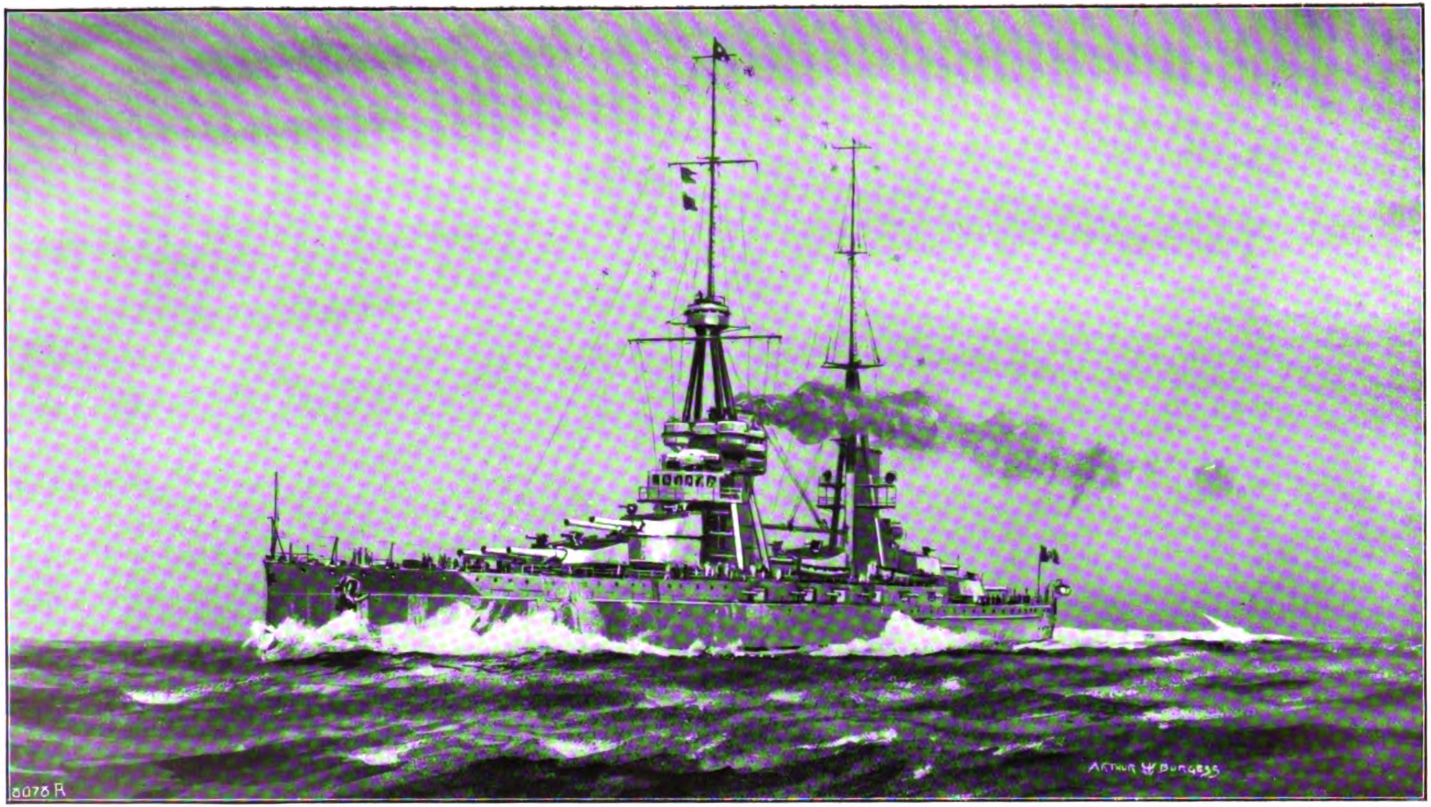
On the question of strategy, Admiral Thaon di Revel, believing the land frontier to be secure, said he saw two dangers. There might be invasion from the sea on a large or small scale, and he pointed to the Ligurian and Tyrrhenian coasts; but the greater danger he considered to be blockade, whereby a powerful enemy could bring about famine, and cut off supplies of metals and coal. Here it may be remarked that many Italian officers, moved by the Nationalist attitude on the Jugo-Slav and Greek questions, have directed attention to the Adriatic, the Ionian Sea, and the Ægean rather than to the Western coasts. That this aspect of the strategical question has not been neglected by the authorities is shown by the importance assigned to Taranto. In Italy, as in France, coast defence is regarded as an integral part of the whole naval power of the nation, and indeed as its base; yet it would be untrue to say that the conception of command of the sea—that is, of sea communications—is not accepted, but, by the very nature of the case, plans of coast defence must occupy a large place in all the naval policy of the Kingdom. Hence the importance that has been attached to destroyers, torpedo boats, and submarines, and now the Naval Air Service is increasing. The principal objects are to protect the naval bases and continental ports and the coastwise traffic.

PROGRAMME AND SHIPS.

The plan now approved was drafted in detail by Admiral De Lorenzi, Chief of the Naval Staff, and is based on the provisions of the Treaty of Washington and on an accepted scheme of limits of age: 20 years for battleships, 15 years for cruisers and gunboats, 12 years for scouts or flotilla leaders, and for destroyers and submarines, and 8 years for motor launches.

Owing to the fact that a number of ships and vessels were built at the same period, they will reach obsolescence at the same time. Indeed, the strength, which is now assumed, apart from battleships, to be 8 scouts, 64 destroyers and torpedo craft, and 43 submarines, would fall in 1931, if there were no construction, to 21 destroyers and 4 submarines. Therefore the new four years' programme, 1924–25, extending to the year 1927–28, includes vessels which are to be completed before 1931. For 1923–24, 2 light cruisers, 4 destroyers, and 4 submarines were authorised. In the first year of the new programme, 1924–25, there are also to be 2 light cruisers, 4 destroyers, and 4 submarines; in the second and third years severally, 4 destroyers and 4 submarines; and in the last year, 1927–28, 1 light cruiser, 4 destroyers, and 4 submarines. Including, therefore, the vessels already authorised, there will be added 5 light cruisers, 20 destroyers, and 20 submarines. The plans for the Naval Air Service are not included in the programme of Admiral De Lorenzi.

But the battle fleet has undergone diminution by obsolescence. It consisted of the 10 ships named in Chapter II. of the Washington



(From a drawing by Arthur J. W. Burgess.

ITALIAN BATTLESHIP CONTE DI CAVOUR.

(For particulars see pp. 441 and 504.)

Treaty—2 of the Duilio class, 3 of the Giulio Cesare class, the Dante Alighieri, and 4 of the Vittorio Emanuele class. The Leonardo da Vinci (Giulio Cesare class) was raised by a triumph of naval engineering skill from the place where she sank at Taranto, and docked, as was explained in the "Annual," 1921–22 (p. 62). It was proposed to recondition and refit her, and she reappeared in the ship list, but now it has been decided that the outlay would not be justified, and she will be scrapped. This is felt by those who salved the ship to be a hard stroke of necessity. The four small ships of the Vittorio Emanuele type (1907–8) were retained in the Treaty list *pro forma*, and the Minister of Marine had authority to sell them. Two have already been removed under the limit of age, and the two that survive, the Roma and Napoli, will soon disappear. Therefore it may be said that only five effective battleships remain, and there is no present intention of adding to their number, though the total battleship tonnage allotted to Italy, as to France, by the Washington Treaty, is 175,000 tons. The three armoured cruisers Pisa, San Giorgio, and San Marco (1908–10) still remain, but are of little value. The limit of age has touched many of the torpedo craft.

On the subject of the arsenals or dockyards, which are fleet bases, Admiral Thaon di Revel said the war had shown that these establishments would not necessarily imply the addition of big, long-range guns, but that they could probably be protected by submarine defences and minefields. He is examining the question of the best type of mine, and proposes to have large supplies in readiness, because mines cannot be provided on the outbreak of war. Regretfully, on grounds of economy, he has had to suppress the dockyard of Naples, which he hopes will yet be reorganised. Meanwhile the Bay of Naples is to be protected by submarine defences.

THE PERSONNEL.

The personnel on the establishment numbers 40,000 men, maintained by the levies of 15,000 in successive years, and completed by 10,000 volunteers, including petty officers. This force is not considered sufficient even for the reduced demands of the Navy. Some shore services are necessary, and the needs of the expanding air service are occupying the attention of the authorities. Admiral Thaon di Revel pointed out that the Navy is a very special profession and that trained specialists cannot be improvised. Untrained men cannot handle the modern elaborate machinery and appliances of the Navy, and therefore the maintenance of an efficient force is in his special care. The two years' service represents for the Navy, it is urged, a dangerous minimum, and imposes on the officers and training staffs the obligation of beginning afresh every year with about one-half of the men. An effort is to be made to amend this situation, which has a dislocating effect, resulting from the calling up of conscripted men in classes at fixed dates. The percentage of long-service volunteers is to be augmented, and the total establishment will be increased progressively to 45,000 by embodying 5,000 volunteers. It is now impossible to increase the general term of service to three years, but it will be extended to twenty-eight months, with the object of providing means of discharging men, and bringing in their successors more gradually. The number of ships in commission is to be increased, and there is a new classification of ships and vessels for manning and mobilization purposes, including ships in full commission, others with nucleus crews or part complements, ranging down from three-quarter complements to one-half, two-fifths, and one-fifth, after which come vessels with only care and maintenance parties. There was mobilization for manœuvres, the first since the war, in August 1923, when destroyers, submarines, airship F.6, and aeroplanes and seaplanes played a prominent part in operations in the Gulf of Taranto and the Ionian Sea. Some of the battleships were also engaged, and there was day and night firing, the latter with the aid of magnesium shells to illuminate the target and largely to eliminate the use of searchlights.

THE COMMANDS.

The Commander-in-Chief directs the whole of the commissioned forces. The main strength is still based on the Ligurian coast, but a strong movement is on foot to direct greater attention to the Adriatic and the Near East. The battleships are based on Spezia, the base of the Caio Duilio, Andrea Doria, Conte di Cavour, Giulio Cesare, and Dante Aligheri, with 8 flotillas of destroyers and a number of submarines. At Spezia are stationed the declassed battleship Regina Elena and other vessels, with 2 cruisers, 15 destroyers, and 10 submarines. A light division is usually in the Levant and another is designated for the Dodecanese, based on Rhodes. Pola and Trieste have together the cruiser San Marco, some light cruisers, 3 flotilla leaders, about 12 destroyers, a large flotilla of modern torpedo boats, and 6 submarines, besides monitors and auxiliaries. Venice has a flotilla of destroyers and torpedo boats. Naples, Maddalena, Messina, and Brindisi have destroyers, torpedo boats and submarines, aircraft and auxiliaries. At Brindisi is the inspectorate of torpedo craft. Taranto, now a well-equipped base, has the battleship Napoli, and usually 4 light cruisers and destroyers, torpedo boats, and submarines. There also is located the Aviation School. Other air stations are at Spezia, Naples, Brindisi, and Pola.

The reorganisation of the port commands is as follows. The chief commands at Spezia, Naples, Taranto, and Pola have been replaced (except Pola) by commands of vice-admirals located at Spezia for the Upper Tyrrhenian Sea, at Naples for the Lower Tyrrhenian, at Taranto for the Ionian Sea and the Lower Adriatic, and at Venice for the Upper Adriatic. The dockyard admirals have now the designation of "Commandante di Arsenale." At Spezia, Taranto, and Pola are rear-admirals' commands, these officers having authority in the ports or places and the dockyards. At Naples a rear-admiral commands the naval base. A captain is the authority at Zara. Greater importance is given to Maddalena as the head-quarters of the defences of that place and of Sardinia, and Messina has a like relation to Sicily. At Brindisi is a naval command, also for the station. Genoa is a naval command. The Naval command at Venice includes the station and the naval base. Special arrangements are made for Tripolitania, Cirenaica and the Islands in the Ægean, these falling within the authority of the Commander-in-Chief in the Ionian and Lower Adriatic. At naval headquarters it is the duty of the chief to study preparations for war, maintain discipline, and preserve efficiency.

THE NAVAL AIR SERVICES.

The Naval Air Service is not yet fully developed. Owing to the length of the coasts and the exposed position of the country to attack, there can be little doubt that air defence will yet assume a very large place in the plans of Italy. Naval officers have been discussing the problems in articles and lectures, and an extensive programme has been prepared. Its features are not yet known, but it is understood that they include the progressive formation of larger flotillas of scouting, bombing, and torpedo 'planes to work with the Fleet and to be located at the naval stations and bases under naval command. The French defensive organisation, which is described earlier in this chapter, has been much discussed in Italy, and it seems likely that the Italian system will follow the same broad lines. It was said early in the year that the Italian authorities were disposed to think the country could best be defended by air means. From what has been said above it will be seen that this is not the case. But it is certain that in the organisation of the fleet of light cruisers, flotilla leaders, and submarines, the air machines will hold a foremost place. There appears to be no intention of separating the Air Service from the Navy. The view is that if an air fleet is to be created to operate with ships at sea, in gunnery and fleet duties, to conduct oversea attack and to take a right place in coast defence, it must be officered, manned, and directed by those who are not only pilots, observers, and workers with bombs and torpedoes, but also, and because of these duties, seamen. The problem is being studied in Italy as in France with a view to organising and using forces of flying boats, seaplanes, aeroplanes, and dirigibles. For work with the Fleet there will be chaser 'planes, and scouting and observing 'planes for photography and spotting, and torpedo and other 'planes, and for coast work, in addition, day and night bombing 'planes. These last-named are wanting, and the Italian Naval Air Service is yet on a small scale, there being in all about 50 seaplanes, chasers, and scouters. The new plans have been prepared by a committee of the Admiralty in Rome, and propose increased expenditure. The development will be progressive. The Minister of Marine is paying much attention to the subject.

GERMANY.

Some account was given in the last "Annual" of the organisation and personnel of the German Navy on its new basis, as regulated by the Treaty of Versailles. There is nothing to add to what was then said, but some personal acquaintance with the Navy enables one to say that it seems, in the smartness of the ships and of officers and men, to be on the same level as before the war. Certainly no effort is spared at the Flensburg-Mürwick school to produce efficient young officers, or in the shore establishments and training ships to promote the physical development and seamanlike knowledge of the men. The battleships are the pre-war ships allowed under the Treaty, but of the light cruisers, six in number, also allowed, only two, the Berlin and Hamburg, are esteemed of much use in the service.

In the winter of 1922-23, the Berlin, which was used as a training ship before the war, and is now engaged in the same duties for the reorganised Navy, visited Sweden, having on board 20 officers, 3 midshipmen, 25 "aspirants" or mates, and 5 engineers of the same class, as well as about 350 men. Afterwards she proceeded to the Norwegian ports. A journalist and an artist were carried as guests, and the former wrote an account of his experiences. He says those on board were more possessed than ever with the spirit of the Hansa maxim, "*Navigare necesse est, vivere non est necesse.*" The cruiser went through the Great Belt and encountered very foggy weather near the Skaw and a great storm in the Skagerrak, heavy seas sweeping the ship from stem to stern. She pitched and rolled in driving snow and hail, and often her bow went down and her propellers raced in the air. Many of the people on board were seasick and a cutter was lost. The storm continued for twenty-four hours and until the ship passed Stavanger and found shelter in the Bukken Fjord. Other ports were visited, and officers and men came back hardened for the sea life. The work of training has since been continued in further cruising, though want of fuel has restricted navigation to some extent.

It is possible that at the Mürwick school something of the Nationalist spirit of the old Navy may remain. The Social Democrats and Communists took alarm, and because of Communist feeling and the danger of the internal situation, the Skagerrak celebrations were generally suppressed, especially at Wilhelmshaven and Hamburg. At Mürwick a memorial tablet was unveiled.

The Navy and Politics.

The events in the Ruhr, and the stirring of national feeling, had their reflection in the Navy. The seamen at Wilhelmshaven were undergoing a period of special exercises, and they adorned their barracks with the black-white-red flag of the former *régime.* When the Navy votes in the Estimates for the Ministry of National Defence were discussed in March, Herr Hünlich, a Social Democrat Deputy, denounced this action, and appeared to ascribe such expressions to defective teaching at the Naval School. He had much praise for the training in general, but thought that the duties of citizens should be taught to the seamen. He declared, and was supported by his party, that education is not satisfactory which does not embody constitutional instruction. The Navy must be taught that it belongs to the Reich, that Germany is a Republic, and that power proceeds from the people. The Minister, Dr. Gessler, took up the defence. He laid stress upon the difficulties arising from the Treaty of Versailles, though admitting that something might be done at Mürwick. But, he said, a high standard was maintained, and protested that the Navy must not be regarded merely as a pattern of political propriety, nor even merely as a training machine. It had serious professional duties, had cleared the Baltic of mines, and assisted shipping beset by ice in the winter. It was filled with a spirit that did honour to the German people. Officers and men were pledged to be restrained in political matters, and any anti-Republican feeling would be visited with punishment or expulsion. Yet he would not repress right practical sympathy with the distressed working classes, nor with the men, women and children who had been killed or injured during the disturbances. If any men, now out of the Service, carried pistols, as seems to have been alleged, that, he said, was not the concern of the Naval administration. They were not Service arms.

The new light cruiser Dresden, which is in hand at Wilhelmshaven to replace one obsolescent, is making slow progress, and cannot be completed before the close of 1924. She will displace 5,600 tons, and carry eight 6-in. guns and three 22-prs., as well as four torpedo tubes. The engines will be of 29,000 H.P. with coal and oil fuel.

Officers of the Pre-War Navy.

Something may be added about the officers of the old Navy. Some of them remain in the new Navy—flag officers, captains, and commanders—and have given to it its spirit, but the great majority have retired from the Service. Comparatively few of them are in search of employment. Some are concerned in the shipping and export and import trades. Others are in commercial enterprises. Thus, one captain conducts a business in oils, colours, lacquers and rust preventives at Hamburg, and had eight officers as agents in various places, including a rear-admiral, a captain, and commanders and lieutenants. Another deals in soil fertilisers and agricultural implements and machinery, and a third runs an internal and external transport business. One captain is managing editor of the Stinnes group of papers, and another manages a theatre. Many have sought their fortunes in other centres, especially in Brazil and Guatemala. They have comradeship societies to look after their welfare, and an organ called "M.O.V., Nachrichten aus Luv und Lee," to make known any vacant opportunities, and publish personal notes.

RUSSIA.

The fighting forces, naval and military, are directed by the Committee of Defence, of which Trotsky is president and Skylansky vice-president. The naval Commander-in Chief, who exercises authority from Moscow, is ex-Rear-Admiral Nemitz; Panzerzhansky is described as Chief of the Staff, and Zimin as chief of all the ports.

A naval programme was adopted for the addition of 5 destroyers and 6 submarines to the Baltic Fleet, and 6 destroyers and 18 submarines to the Black Sea forces. But from all available information, it seems unlikely that the material progress reported last year has been maintained. Yet it is quite certain that the Soviet Government is turning its mind, and will yet turn its activities, to the sea. Two causes have been operating to check any considerable work on the existing ships. Money is not obtainable for large reconstruction, and it seems probable that financial resources have been diverted to the Red Army, which, also on financial grounds, has been reduced. The other cause is the conviction that as costly battleships cannot be built and maintained by Russia, and as their use is uncertain, it will be well to devote any money that can be voted to light cruisers and flotillas and the Air Force. Work on the battleship Demokratiya, in the Black Sea, has been stopped; also on 22 new destroyers, of which class only 5 are now being completed.

The active fleets have been reduced—in the Baltic is only one battleship, the Marat, flagship of the ex-Lieut. Viktoroff, and in the Black Sea no battleship at all—and the ships and vessels are reported to be in poor condition, with a shortage of officers and specialists, and lack of fuel and other material supplies. There is a class of vessels said to be undergoing repairs, but little work is in progress. The ships in reserve, comprising the major portion of the existing Fleet, have only care and maintenance parties on board, and no exertion could make them available for sea within six months. No ex-German officers are known to serve with the Fleet, but it is almost certain that German artificers have been employed.

Situation in the Baltic and Black Sea.

In the Baltic, ex-Vice-Admiral P. N. Lyeskoff, in the Admiral Makaroff, commands the Petrograd Base, with a Commissar, and there is an ex-captain at Kronstadt. Officers are also appointed to command nominally the battle and cruiser squadrons, and the flotillas. In the active fleet are 7 first-class and 4 second-class destroyers, with 8 submarines in two divisions, and mining and miscellaneous vessels. In the reserve the principal ship is the Pariskaya-Kommuna (formerly Sevastopol), and the battleships Poltava, Gangut and Grashdanin have been removed from the list. One or more big ships have reached Hamburg to be scrapped. The cruisers Rurik, Bayan, Rossiya, Gromoboi, Admiral Makaroff, Aurora and Diana have been condemned, and in the same category are many destroyers, submarines, gunboats and other vessels. In the Arctic and White Sea, where ex-Rear-Admiral Raskoffoff is in command, with headquarters at Archangel, are only a few vessels—a submarine and two minelayers in commission, with auxiliaries, and the old battleship Chesma, and other vessels, in reserve.

In the Black Sea, the naval chief is Maximoff, and the commander at Odessa and Nikolaieff, Pini. At these places, and at Novorissisk and Sevastopol, are port commanders. The active fleet comprises a gunboat, about 20 destroyers, 4 submarines, a mining squadron, and some armed steamers and patrol boats, but 2 destroyers and the submarine Trotsky were reported to have been lent to the Angora Government. The five old battleships, the engines of which were destroyed by explosives on April 25, 1919, are quite valueless. The cruiser Pamyat Merkuriya, which accommodates the naval staff at Sevastopol, is in reserve, with 1 submarine, about 3 destroyers, some mining, submarine chasing and other vessels. The 8 light cruisers—4 of 6,800 tons and 4 of 7,600 tons—are being continued, and 3 have been completed in 1923. The Admiral Nakimoff was to be renamed Kemal Pasha. There are flotillas also on the Dnieper, in the Caspian, and on the Volga.

The ships which escaped when General Wrangel evacuated Sevastopol, November 14, 1920, are still at Bizerta, all reported to be beyond repair. Early in the year, the French Government presented to the Chamber a proposal to sell them to cover expenditure and to compensate France for her losses in supporting Wrangel's army. Litvinoff thereupon despatched a note of protest, in March, calling attention to the fact that the Soviet Government had warned the French Government that its detention of the ships was illegal, that they ought to be returned to the Russian authorities, who would hold France responsible for any injury to them. Nothing has yet been done in the matter.

Progress with the Air Service.

Concerning the Russian Naval Air Service, little is known, but here, if anywhere, progress is being made. The Petrograd Military District possesses 4 seaplane detachments and 2 chaser detachments of the Baltic Fleet, which would be operated from Oranienbaum, Guteff Island, Peterhof and Lisi Nos. In the Black Sea there is greater activity. The fleet has about 30 machines in all, forming 5 aeroplane detachments, 3 chaser detachments, and a seaplane detachment. In addition, at Rostoff, the North Caucasian Military District has 8 seaplanes and chasers, and there are reported to be 6 machines each at Odessa and Nikolaieff, and at the last-named place a seaplane station. Trotsky, who is chief of an aeroplane committee, takes great interest in this development, and subscriptions are being asked to increase the Air Fleet. Much of this, no doubt, will be devoted to military services. The plan is to have, in 1924, ten thousand aeroplanes, which may not be accomplished, for money is difficult to raise, and there are now only five aeroplane works in Russia in activity, and others supplying parts. At the present time there are probably not more than 250 'planes all told. Many have been bought abroad. There are four pilot schools, and a high level of scientific and mechanical training is kept. Excellent theoretical and technical treatises are published, and a large number of German airmen, instructors, and mechanics are employed.

OTHER FOREIGN NAVIES.

DENMARK.

The Commission appointed in 1919 to inquire into the future organisation of the defensive forces, presented its report in May 1922, as was stated in the "Annual" for 1923. The plans were considered by the Government, and new Military and Naval Acts were passed in the summer of 1922 and were confirmed by the King in August of that year. In the Naval Act, the principal object of the Fleet is defined as follows:—

To defend the national security of the State, and to protect its supremacy and neutrality in accordance with the Act of the League of Nations and other Conventions which the State has entered into, and to this end to maintain the security of the coasts and to guard neutrality in territorial waters, to maintain the connection between the parts of the realm and to protect transport at sea and the Danish shipping.

The Fleet is to consist of the following units:—6 coast defence ships (Orlogsskibe), 24 torpedo-craft and submarines, with mining ships, flying boats, aeroplanes, and auxiliaries.

The coast-defence ship Niels Juel has been completed and put into commission during the past year. No ship has been removed from the list.

In 1923-24 it is intended to expend 10,342,000 crowns on new construction and 1,259,000 crowns on the Naval Air Service.

A very serious accident occurred on May 25 on board the light cruiser Geiser while a division of the Navy was on a training cruise south of Zealand. A demonstration was being made of apparatus for developing smoke screens. On the deck of the cruiser were the commanding officers of the other ships in the division. During the demonstration the apparatus exploded, and fifty persons were injured, sixteen of them seriously. Some threw themselves into the water, but were rescued, with the exception of one sailor. Among the injured were the commanding officer of the Geiser, Captain Godfred Hansen, the Arctic explorer, and Commander C. V. Evers, recently Danish Naval attaché in London, who was attending the manœuvres.

NETHERLANDS.

A full account was given in the "Annual" for 1923 (pp. 55-56), of the naval policy of the Netherlands in regard both to home defence and the defence of the Dutch East Indies. The organisation there described is progressing, though the difficulties are great. The Commission which was appointed November 21, 1922, to inquire into the question, recognised the financial problem involved in expansion. There is now no permanent squadron in home waters, the ships and vessels being distributed at the Middelburg and Willemsoord stations, the latter at the Helder. Few of the ships and vessels are kept in commission. The chief development is in the Air Service. There are centres at the Texel, the Helder, Amsterdam, and Walcheren, which places have, in all, nearly eighty seaplanes, single-seater fighting machines, and instructional machines.

Attention is chiefly directed to the Dutch possessions in the East, where the maintenance of neutrality is the object. The Royal Netherlands Naval Squadron in the Dutch Indies now consists of the coast-defence ship De Zeven Provincien and 8 destroyers. The light cruisers Java and Sumatra, intended for the East Indies, have not yet been completed. The Indian Military Marine comprises 2 gunboats, 4 minelayers, 8 torpedo boats, 6 submarines, to which 4 are to be added, and some surveying and other craft. At Priok are about 24 Van Berkel biplanes and seaplanes.

A ten-years' shipbuilding programme has been introduced, comprising 2 battleships, 12 destroyers, 6 torpedo-boats, 10 submarines, 6 submarine minelayers, and 160 flying machines, but there is strong opposition, and the plans are yet unsettled. Dr. de Geer, Finance Minister, who was pledged to economies, resigned, and was succeeded by Dr. Colijn. The Ministerial Council now proposes to bring the matter forward early in 1924. The total cost is estimated at 300,000,000 gulden, mainly to be borne by the Dutch East Indies. There is some talk of a base in the Niouw Archipel, opposite to Singapore.

NORWAY.

The Committee on National Defence, the appointment of which was recorded in the "Annual" for 1923, has presented its first report on the organisation of the naval defences. The majority recommended that these defences should be organised on the strategical bases that in a war in which Norway remains neutral, the Fleet may be able to protect the neutrality of the country, and that in a war in which Norway is involved, it may be in a position to defend the coasts, maintain coastwise communication, prevent a blockade, and support the Army. It had been proposed that the coastal defence should be assigned to the Navy, but, so far as has now been arranged, this change will not be made, and it will remain under the Army.

The Navy Estimates for 1923–24 have been voted with an expenditure of 12·6 million kroner, of which kr. 300,000 are for new construction. To this may be added an extra vote of 3·3 millions, whereof 2·5 millions are for continued construction of submarines B. 3 and 4. B. 1 has been completed, and B. 2 is to be ready in the winter of 1923–24.

The personnel of the Navy at present amounts to about 1,200 in permanent commission (officers, warrant officers, and men). In addition, from 500 to 700 conscripted seamen are yearly called out to serve their time.

The Defence Committee seems to have directed some attention to the development of the Naval Air Service, but its proposals await acceptance. The suggested plan is to bring the naval and military services under one command, with a joint construction department, flying school, and school for mechanics, but separate scout flying courses, implying difference of function. The stations have been increased in number, and are now located at Horten, Tonsberg, Evje, Bergen, Trondjem, and Vadso. In all there are about 36 seaplanes and 20 other 'planes. A large increase is proposed.

There are some additions to the mining flotilla, and to the armed auxiliaries.

SWEDEN.

The naval policy of Sweden has recently been brought under much discussion and some revision. It is based on the plans of 1914, which defined the naval forces as consisting of a coast fleet and certain fixed defences. The fleet was to consist of two divisions, each of four ships; four divisions of destroyers, each comprising four vessels; two divisions of submarines, each of three boats; and two mine-layers. The system of the German Navy Law was followed, to some extent, in fixing age limits for armoured ships, and also for destroyers and submarines. The intended successive building periods extended severally over five years. The 1915–19 period—the first of the programme—included three ships of the Sverige class, two 500-ton destroyers, and two submarines, Provision was made for improving the fixed defences of Hemsö and the Norrland coast. The Riksdag sanctioned two of the big ships, the Drottning Victoria and Gustav V., which have been completed, as also two destroyers, Wrangel and Wachtmeister—four had been sanctioned—and, under the provisions of 1914 and 1915, six submarines, Hajen, Sälen, Valrossen, Bävern, Illern and Uttern, have been built, to which the Valen is to be added, with two motor launches or torpedo boats. Financial restrictions have checked the programme, though four additional submarines are contemplated, and additions to the personnel have been sanctioned.

A commission was appointed to inquire into the question of future building, examining it from the naval and economical points of view. There was much discussion, and certain types of ships and vessels were indicated; armoured vessels, destroyers, motor torpedo boats or launches, submarines, vedette boats and others of special types. The armoured ships (3) were intended to be of 6,200 metric tons and 29 knots, with six 8·2-in. guns, three 12-pdrs., and two 20·8-in. above-water double torpedo tubes; the destroyers (12) of 900 tons and 35 knots, with the same torpedo armament as the bigger ships, and three 4·7-in. guns, one 12-pdr., and two anti-aircraft guns; and the submarines for torpedo-work (6) and others (3) for mine-laying. This programme—which also included for local service a number of submarine chasers and vedette boats—could not, owing to the high cost of construction, be completed until 1934. The Naval Air Service is to comprise 42 observing 'planes, 18 scouting 'planes, 12 torpedo 'planes, and 24 chasers, based on six stations.

A new classification of the intended Fleet has been adopted: 6 armoured vessels, 3 cruisers—the Fylgia is now the only representative,—8 destroyers, 8 torpedo boats, 2 motor launches, 7 submarines, 3 special vessels, and 12 vedettes. For local service there will be 3 armoured vessels, 1 cruiser, 13 torpedo boats, 10 submarines, 3 special vessels, and 7 vedettes; and in the material reserve 5 armoured vessels, 2 cruisers, 2 destroyers, 6 torpedo boats, 2 special vessels, and 1 barrack-hulk.

Although the Navy is organised for coast-defence duties, it is kept in a state of high efficiency and is in practice a sea-going force. The fourth division, with destroyers and torpedo boat and submarine flotillas, was kept in commission during the winter, and the armoured ships Sverige (flag), Drottning Victoria, and Gustav V., with the two new destroyers Wrangel and Wachtmeister, under command of Rear-Admiral Riben, Commander-in-Chief of the Swedish Fleet, visited Sheerness and Rosyth in July 1923, and the armoured cruiser Fylgia, engaged in the training service, which had returned from a long cruise to South American ports, accompanied the squadron to Sheerness and proceeded to Gibraltar. The local torpedo boats, mostly at Stockholm, are now regarded as obsolescent. Several of them broke down during coastal manœuvres last year.

FINLAND.

As is the case with all the small navies, the War Minister directs the naval forces. The coast defences are under the Army, but there is a naval adviser. The naval forces, which consist almost entirely of torpedo craft, patrol vessels, and mine-sweepers taken over from the former Russian Navy, are under a commodore. No additions have been made.

ESTHONIA.

The little Navy of this new state is administered under the Minister of War, with a naval commander in charge of the naval forces, which are inconsiderable, consisting of two destroyers, and gunboats, mine-layers and mine-sweepers.

LATVIA.

The reduced programme comprises 4 destroyers (900 to 1200 tons), 4 submarines and 2 mine-sweepers, to be completed within four years.

BELGIUM.

There is little to report about the Navy of Belgium except that three of the 14 torpedo boats are efficient, and the rest doubtful; six of them are certainly unfit for service. A flotilla of 17 motor and steam vedettes or launches is maintained on the Rhine.

SPAIN.

There is no change to be recorded in the naval policy of Spain, except in the development of the flying service. The light cruiser Reina Victoria Eugenia, 5,590 tons, completed her trials in January 1923, and was delivered to the Ferrol dockyard. She is intended to join the Instructional Squadron, which is composed of 3 battleships, 3 destroyers, and 4 auxiliaries, with the Carlos V. and 6 torpedo boats of the Vigo division attached.* The gunboats, other torpedo craft, and auxiliaries, are divided between the northern ports, Cadiz (which is the base for the ships serving off Morocco), and Cartagena. At Barcelona, the ships are directly under the orders of the Admiralty, and comprise the Giralda, special service vessel, for the use of the High Commissioner, Morocco, some torpedo boats, and 7 submarines, forming a submarine instructional division. The Minerva is the training ship. The three coastal gunboats are making progress at Ferrol.

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* The battleship España, returning from Malaga, went ashore at Cape Tres Forcas in September 1923, and the salvage operations presented great difficulties.

The Naval Flying School has its headquarters in the cruiser Rio de la Plata, and comprises the aircraft carrier Dedalo, from which operate aircraft built by the Stabilimento Construzione Aeronautiche. One airship is of the Auro type, and another reckoned in the naval establishment is the España, described as an army airship, now at Guadalajara, near Madrid. The naval seaplane base is at Barcelona, and has 12 Macchi flying boats, 12 Savoia two-seater float seaplanes, 11 F.3 flying boats with 350 H.P. Rolls-Royce engines, and some other machines. At Cartagena are 7 Bristol fighters, and 6 Savoia S.16-type float seaplanes, and at Prat de Llobregat, where there is an important aerodrome, 15 Avro-type machines, used for the early instruction of naval pilots, and the Auro airship referred to above.

The sum allotted to the Navy in 1923–24 is about £5,000,000 at par, exclusive of naval charges for Morocco, being a slight increase on the preceding year.

PORTUGAL.

The Navy of our ancient ally Portugal makes no progress. The old Vasco da Gama still flies the broad pennant, but the three obsolete light cruisers have been dismantled as well as several of the gunboats. No additions have been made since the two British sloops were bought.

The Naval Air Service is likely to develop. The great achievement of Rear-Admiral Gago Coutinho and Commander Sacadura Cabral in flying from Lisbon to Rio de Janeiro is an inspiration. The Club Militar Naval, of Lisbon, has published an account of the flight, and a very clear description of the instruments used. The chief of these is the course correcter, with which a perfectly accurate dead reckoning can be made. The description is in Portuguese, French, English, and German (*Anais*, vol. 53, Nos. 10, 11, 12).

GREECE.

There are few changes in the Greek naval forces. Economies are being enforced, and on that ground the Hellenic Government decided to dispense with the British Naval Mission, which had been lent since November 1921, and Rear-Admiral Aubrey C. H. Smith, C.B., and other officers returned in June 1923.

An armoured cruiser which was being built at the Vulcan Yard, Hamburg, in 1914, has recently become a subject of dispute between an American contractor for steel work, the Hamburg Company, and the Greek Government, which stopped payment, and claims return.

TURKEY.

By the terms of the Treaty of Sèvres, the Ottoman Navy was to be abolished, save that a few gunboats or other vessels were to be left to Turkey for fishing and police duties. By the Treaty of Lausanne everything is changed. Except that the ex-Goeben is at Prinkipo in the Gulf of Ismid, and that some launches and other vessels are employed mostly on civil duties, all the ships of the former Navy were interned in the Golden Horn. They had Turkish crews, but were under Allied supervision. The only vessel of any value is the ex-Goeben, which, with some old armoured vessels, light cruisers, destroyers, and gunboats, had been assigned to Great Britain. None of these is effective, and the Goeben herself will require a complete overhaul and refit, if she is not to be scrapped. In the same way, the old Torghud Reis (ex-Weissenburg) was assigned to Japan, and Portugal was to have a gunboat. The Inter-Allied Commission of Control had been authorised to restore to Turkey three destroyers of the Samsoun class in place of inferior torpedo boats.

Under the Treaty negotiated at Lausanne, all Turkish vessels in Allied hands are returned to the Ottoman Government in their present condition, as also are all arms and ammunition. In addition to the ex-Goeben and the Torghud Reis, are 3 other old armoured vessels, 2 light cruisers, 6 destroyers, 6 torpedo boats, 1 sloop, 9 various gunboats, 4 mine-layers, and some motor launches, as well as certain vessels of no importance which the Angora Government controlled. Nothing is known of the future of the Ottoman Navy. It is provided that a naval base may be established at Constantinople, and Turkish warships may pass through and anchor in the waters of the demilitarised zones, but no submarine engines other than submarine boats may exist there. The islands of Imbros and Tenedos revert to Turkey

ROUMANIA.

The Roumanian Navy is administered as a department of the War Ministry, and is divided between the Danube and the Black Sea. Rear-Admiral the Crown Prince Carol was appointed Inspector-General in 1921, and has a technical Inspector-General under him, with a naval staff, and a director of the Navy Department. The Sea Flotilla consists entirely of surface torpedo craft, with 4 gunboats and some motor launches (M.A.S.) bought from Italy. The Danube Flotilla, commanded by Rear-Admiral Gavrilesco, comprises all the monitors and vedettes, and there are inconsiderable forces at Constanza, Sulina, and Galatz.

BRAZIL.

The reorganisation of the Navy, which was recorded in the "Annual" last year, is still in progress. The two battleships Rio de Janeiro and Minas Geraes, which have been reconstructed at the Brooklyn Navy Yard, U.S.A., now constitute the main element of the Central Patrol, based on Rio, which also includes 4 light cruisers and 10 destroyers, with auxiliaries.

A considerable impetus was given to reconstruction of the naval defence by the former Minister of Marine and the Chief of the Naval Staff, and the work is being prosecuted by their successors, Admiral Alexandrino Alencar and Vice-Admiral A. de Fonseca Rodriques. Relations were entered into with the United States naval authorities, and a mission was despatched to Rio to supervise the work. For reasons which need not be entered into here, but are probably not without relation to the withdrawal of the British squadron and the consequent loss of influence, the Brazilians have turned to the United States, and contracts have been placed with American firms for the supply of naval material.

There is greater activity in training the personnel, and the courses of instruction which Brazilian officers underwent when the ships were at Brooklyn and during American naval manœuvres, have had a vivifying effect. The Benjamin Constant is the cadets' training ship, and there are 3 training ships for boys. The flying service is also active, and has its base at Euxadas Islands, where are about 30 seaplanes, and 4 float-seaplanes, the latter presented by the United States.

ARGENTINA.

A very energetic effort to give greater efficiency to the Argentine naval forces is evident. There is a considerable extension of wireless telegraphy in the Navy and Mercantile Marine, with principal stations at Buenos Aires, Corrientes, and Deseado. In the ships, wireless instruments have been installed for taking angle bearings, as also at Buenos Aires, Mogotes, San Antonio, and Puerto Militar.

The reorganised system of training for officers, instituted more than a year ago, is now at work. Cadets at the naval school undergo courses in compass, navigation, meteorology, electricity, and wireless, some gunnery and engineering, and languages. For midshipmen the course is of six months' duration, followed by sea training. The Presidente Sarmiento has been making a long cruise, with sub-lieutenants and midshipmen, and has visited many ports, including Hamburg. There is now a school for the supplementary training of lieutenants, in relation to courses in mining, torpedo, and submarine duties. The work of the Superior Naval School for lieutenants and commanders is being organised near the Naval Academy at Buenos Aires.

CHILE.

Financial stringency has made impossible any expansion of the floating strength of the Chilian Navy, and the proposed purchase of foreign warships has been abandoned. The appointment of Captain G. N. Tomlin, R.N., as chief of the Naval War College at Valparaiso, gave a great impetus to training and to the higher studies of officers. The active squadron consists of the battleship Almirante Latorre, the light cruiser Chacabuco, and the 5 modern destroyers, with the 6 submarines attached, which were ceded by the British Government to Chile in 1917. The five torpedo boats (Yarrow 1896–1898) are to be sold.

The only real development has been in the Naval Air Service, to which great importance is attached, and it is worthy of note that the air officers are officers of the Navy, specialised in aviation, as are submarine officers in the submarine branch. A provisional base for seaplanes was established at "Las Torpederas," Valparaiso, whence the first machine flew in May 1921. The Naval Air Service is attached to the Direccion de Artillería under Rear-Admiral Luis Langlois, and the chief, since 1921, has been Commander Edgardo von Schroeders, who has, as technical adviser, Lieut.-Col. Travers, ex-R.A.F.

The present material of the Naval Air Service is composed of 2 Sopwith and 2 Avro seaplanes, each with 175-H.P. Clerget engines, 6 Short machines (Sunbeam 270 H.P.), 2 Supermarine flying-boats (Puma 240 H.P.), and 1 F.2A. machine with 2 Rolls-Royce engines of 350 H.P.

Within two years, in difficult circumstances on account of lack of facilities, great advances have been made. After studying the coasts, the harbour of Quinteros, north of Valparaiso, has been chosen as the principal base for the Naval Air Service, and the work on the hangars and other buildings has recently commenced. Instruction has been organised and courses have been inaugurated to meet the desires of the officers, whose enthusiasm to join the Service is increasing almost every day. Instruction begins at Quinteros, with a short course as observers, and then officers go to the Aviation School at "El Bosque," near Santiago, and receive their brevet together with the officers of the Army; after that they finish their course at the Naval Base, when they get their titles as specialists in naval aviation. There have been exercises of co-operation against submarines and practice scouting, navigation and formation. Short machines have been hoisted on board the battleship Latorre for spotting during battle-practice. Wireless and telephony have been installed in service machines and there has been good practice in aerial photography, including an aerial survey of the naval base at Quinteros.

A large flying-boat for the Chilian Navy has just been asked for, which it is hoped will be the first of an important naval squadron. The navy attaches great importance to this kind of machine.

CHINA.

There is no certainty about the Chinese Navy, which once, within its measure, was an efficient force. The shadowy authority of the Government, the disturbed state of the country, with piracy flourishing on the rivers, and the disappearance of available funds, have weakened and broken the Navy. A mutiny broke out in April 1923, as a protest against the appointment by the central government of a general to command at Fukien, and as a consequence Admiral Tu-Hsih-Wei, Commander-in-Chief, resigned. There is some show of authority at Canton, and the Fleet still seems to preserve the organisation of a First Squadron at Chefoo, where are the two remaining cruisers, with vessels detailed at Shanghai and Nankin, a second squadron of torpedo vessels and river gunboats in the Yangtse, and a Kuang Tung flotilla of like character, as well as a small training establishment.

JOHN LEYLAND.

CHAPTER III.

COMPARATIVE NAVAL STRENGTHS.

THE Washington Naval Treaty has now been ratified by the five Powers which took part in the Conference—the British Empire—which was regarded as one unit, embracing the Dominions as well as India—the United States, France, Italy, and Japan. As a result of this agreement, the greatest destruction of naval war material which has ever taken place is now being completed. No fewer than 68 capital ships are affected by the Treaty, and all but 4 of them have been or are being broken up. The Treaty provides that two of the discarded battle-cruisers of the United States, as well as two of the battle-cruisers of Japan, which were under construction when the Treaty was signed, may be converted into aircraft carriers. The other 64 ships will within a short time have ceased to exist.

This clearance of the lists is all the more remarkable since none of the vessels was obsolete, and they include 23 which were in course of building when the Conference assembled. All the completed vessels condemned under the Treaty were finished since the opening of the present century, and several of them were of comparatively recent construction. New and old alike have, however, disappeared from the effective lists.

This clearance of naval war material has been carried out by three only of the five Powers affected by the Treaty, since neither France nor Italy was called upon to discard any vessels of their fleet, and neither Power was engaged in building new units.

The influence of the Naval Treaty on the various fleets is revealed in summary in the following statement, showing the number of ships of the several Powers scheduled for scrapping :—

	Built.	Building.
British Empire	20	4
United States	15	13
Japan	10	6
France	..	..
Italy	..	..
	45	23
To be converted into aircraft carriers .	..	4
Number to be scrapped	64	

Before the Conference assembled at Washington, the British Admiralty had already dispensed with 13 capital ships, and, though Italy was required to scrap no vessels, the Minister of Marine has been given power to remove the Roma, the Vittorio Emanuele, and the Regina Elena from the effective list and to dispose of them. Consequently, under the movement initiated in Great Britain and carried a stage further at the Washington Conference, 84 capital ships have already been, or are now being, dealt with either by the process of scrapping or by conversion into aircraft carriers.

Appended is a list of the capital ships scheduled to be scrapped under the terms of the Treaty:—

BRITISH EMPIRE.

BUILT.

Name.	Launched.	Displacement.	Main armament.
		Tons.	
Commonwealth	1903	16,350	4 12-in., 4 9·2 in., 10 6-in.
Agamemnon	1906	16,500	4 12-in., 10 9·2-in.
Dreadnought	1906	17,900	10 12-in.
Bellerophon	1907	18,600	10 12-in., 16 4-in.
St. Vincent	1908	19,250	10 12-in., 18 4-in.
Inflexible *	1907	17,250	8 12-in., 16 4-in.
Indomitable *	1907		
Superb	1907	18,600	10 12-in., 16 4-in.
Neptune	1909	19,900	
Hercules	1910	20,000	
Temeraire	1907	18,600	10 12 in., 16 4-in.
New Zealand *	1911	18,800	8 12-in., 16 4-in.
Lion *	1910	26,350	8 13·5-in., 16 4-in.
Princess Royal *	1911		
Conqueror	1911	22,500	10 13·5-in., 16 4-in.
Monarch	1911		
Orion	1910		
Australia *	1911	18,800	8 12-in., 16 4-in.
Agincourt	1913	27,500	14 12-in., 20 6-in.
Erin	1913	22,940	10 13·5-in., 16 6-in.
BUILDING.			
Four *	—	—	—

* Battle cruisers

Before the Washington Conference assembled the following thirteen capital ships, all of which took part in the Great War, had been scrapped or converted to non-combatant purposes: Cæsar, Dominion, Hibernia, Hindustan, Lord Nelson, Mars, Queen, St. Vincent, Swiftsure, Zealandia, Collingwood, Colossus, Crescent (late Glory).

FRANCE.

BUILT AND BUILDING.

None under Washington Treaty.

ITALY.

BUILT AND BUILDING.

None under Washington Treaty.

UNITED STATES.

BUILT.

Name.	Launched.	Displacement. Tons.	Main armament.
Michigan	1908	16,000	8 12-in.
South Carolina	1908		
New Hampshire	1906	16,000	4 12-in., 8 8-in., 12 7-in.
Vermont	1905		
Kansas	1905		
Minnesota	1905		
Louisiana	1904		
Connecticut	1904		
Nebraska	1904	14,948	4 12-in., 8 8-in., 12 6-in.
Rhode Island	1904		
Georgia	1904		
New Jersey	1904		
Virginia	1904		
Maine	1901	12,300	4 12-in., 16 6-in.
Missouri	1901		

BUILDING.

Name.	Launched.	Displacement. Tons.	Main armament.
Washington	1921	32,600	8 16-in.
South Dakota	—	43,200	12 16-in., 16 6-in.
Indiana			
Montana			
North Carolina			
Iowa			
Massachusetts			
Constellation *	—	43,500	8 16-in., 16 6-in.
Ranger *			
Constitution *			
United States *			
Lexington *†	—	33,000	Not to exceed 10-in.
Saratoga *†			

JAPAN.

BUILT.

Name.	Launched.	Displacement. Tons.	Main armament.
Settsu	1911	20,800	12 12-in., 10 6-in., 8 4·7-in.
Aki	1907	19,800	4 12-in., 12 10-in., 8 6-in.
Satsuma	1906	19,350	4 12-in., 12 10-in , 12 4·7 in.
Kashima	1905	16,400	4 12-in., 4 10-in., 12 6-in.
Katori	1905	15,975	4 12-in., 4 10-in., 12 6-in.
Hizen	1900	12,700	4 12-in., 12 6-in.
Mikasa	1900	15,200	4 12-in., 4 10-in., 10 6-in.
Kurami *	1907	14,600	4 12-in., 8 8-in., 14 4·7 in.
Ibuki *	1907		
Ikoma *	1906	13,750	4 12-in., 10 6-in., 8 4·7 in

BUILDING.

Name.	Launched.	Displacement. Tons.	Main armament.
Kaga	1921	40,100	10 16-in., 20 5·5-in.
Tosa	1921		
Akagi *†	—	42,000	10 16-in., 20 5·5-in.
Amagi *†	—		
Takao *	—	42,000	10 16-in., 20 5·5-in.
Atago *	—		

* Battle-cruisers.

† To be converted into aircraft-carriers.

As soon as the two British battleships now under construction in accordance with the Treaty are completed and enter the British Fleet, the existing battleships King George V., Ajax, Centurion, and Thunderer will be scrapped, and the British Fleet will then comprise 17 pre-Jutland and 3 post-Jutland ships, as compared with 15 and 3 respectively in the United States Fleet. When these two British vessels leave the slipways at an early date, there will not be a single capital ship building in any country, and that condition will persist until 1927, when France and Italy may each lay down a unit.

While the Washington Treaty has arrested the building of capital ships throughout the world, there is considerable activity in other directions. No light cruisers have been laid for the British Fleet since the conclusion of peace, but 4 vessels belonging to the war period are in course of construction. The United States has in hand 10 light cruisers, and Japan 8, and the latter country proposes to lay down 6 more. Eight light cruisers are also in the programme which Congress is being asked to approve in 1924 for the American Navy. France has already begun the building of 3 light cruisers, and Italy proposes to lay down 2, while Germany has 1 in hand. It is stated that Russia has 8 vessels of this type under construction, but little is known as to the progress which is being made upon them.

Six aircraft carriers are being completed, 2 each for the United States and Japan, and 1 for the British Empire and France respectively. The latter country is also building 6 flotilla leaders, Italy 3, and 2 are making progress in British yards. Only 4 torpedo-boat destroyers are being built for the British Fleet, and the American programme has been completed. On the other hand, Japan is making progress with 8 of the first class and 9 of the second class, and proposes to lay down 21 additional destroyers of the first class. France has on the slips 12 destroyers and Italy 8. Great activity is being exhibited in turning out submarines. While only 8 are building in British shipyards, 27 are under construction in the United States, 11 in Japan, and 13 in France. Japan proposes to lay down 28 more submarines, and Italy 4; while 3 are in the new American programme awaiting approval by Congress.

It is thus apparent that, in spite of the Washington Treaty, the various naval Powers are turning increased attention to the construction of light cruisers, destroyers, and submarines.

The usual tables of battleships, battle-cruisers, aircraft carriers, and light cruisers of the five great Naval Powers are appended.

THE EDITORS

TABLE I.—EFFECTIVE FIGHTING SHIPS, BUILT AND BUILDING.

Class.	British Empire.			France.			Italy.			U.S.A.			Japan.		
	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.	Built.	Building.	Total.
Battleships, 14-in. guns and upwards	10	2	12	—	—	—	—	—	—	12	2	14	6	—	6
Battle-cruisers, 14-in. guns and upwards	3	—	3	—	—	—	—	—	—	—	—	—	4	—	4
Battleships, smaller guns	8	—	8	9	—	9	9	—	9	4	—	4	—	—	—
Battle-cruisers, smaller guns	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—
Aircraft carriers	5	1	6	—	1	1	—	—	—	1	2	3	1	2	3
Light cruisers	50*	4	54	5	3	8	10	2†	12	9	8† 10	19	15	8 6†	29
Flotilla Leaders and Destroyers	201	6	207	51	18	69	59	11	70	315§	—	315	71	17 21†	109
Submarines	66	8	74	47	13	60	43	4†	47	100	27 3†	127	40	11 28†	79

* Includes Courageous and Glorious, large light cruisers, special type.

† Projected.

§ Includes seven destroyers stranded and feared lost, September 9, 1923.

TABLE II.—BATTLESHIPS WITH 14-IN. GUNS AND UPWARDS.

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.
		tons.									tons.			tons.
—	*Nelson*	35,000							1921	*Colorado* †	32,600	1920	Mutsu	33,800
—	*Rodney*								1921	*West Virginia* †		1919	Nagato	
1915	Malaya	27,500							1920	Maryland		1917	Hyuga	31,260
1914	Valiant								1919	Tennessee	32,300	1916	Ise	
1914	Barham								1919	California		1915	Yamashiro	30,600
1913	Queen Elizabeth								1917	Idaho	32,000	1914	Fuso	
1913	Warspite								1917	New Mexico				
1915	Royal Sovereign	25,750							1917	Mississippi				
1914	Royal Oak								1915	Arizona	31,400			
1915	Revenge								1915	Pennsylvania				
1915	Resolution								1914	Oklahoma	27,500			
1916	Ramillies								1912	Texas				
									1914	Nevada	27,000			
									1912	New York				
	12 ships.	335,350								14 ships.	429,700		6 ships.	191,320

TABLE III.—BATTLE-CRUISERS WITH 14-IN. GUNS AND UPWARDS.

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched	Name.	Displacement.	Launched.	Name.	Displacement.
		tons.												tons.
1918	Hood	41,200										1913	Kirishima	27,500
1916	Renown	26,500										1913	Haruna	
1916	Repulse											1912	Hiyei	
												1912	Kongo	
	3 ships.	94,200											4 ships	110,000

NOTE.—Vessels of which the names are printed in italics are under construction. † The Colorado and West Virginia were due to be completed at the end of 1923.

TABLE IV.—BATTLESHIPS WITH SMALLER GUNS.

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.
		tons.			tons.			tons.			tons.			tons.
1913	Benbow	25,000	1913	Bretagne	23,177	1913	Andrea Doria ...	22,562	1911	Arkansas	26,000			
1913	Emperor of India		1913	Lorraine		1913	Caio Duilio		1911	Wyoming				
1912	Marlborough ...		1913	Provence		1911	Conte di Cavour...	22,023	1910	Florida	21,825			
1912	Iron Duke		1911	Courbet	23,095	1911	Giulio Cesare ...		1909	Utah				
1912	Ajax	23,000	1911	Jean Bart		1910	Dante Alighieri ...	19,190	1909	Delaware ‡	20,000			
1911	Centurion		1912	Paris		1907	Roma	12,655	1908	North Dakota ‡ ...				
1911	King George V....		1909	Diderot	18,561	1905	Napoli							
1911	Thunderer	22,500	1909	Condorcet	18,587	1904	Vittorio Emanuele *							
			1909	Voltaire	18,457	1904	Regina Elena *...							
	8 ships.	191,500		9 ships.	194,421		9 ships.	158,980		4 ships.	95,650			

TABLE V.—BATTLE-CRUISERS WITH SMALLER GUNS.

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.
		tons.												
1913	Tiger	28,500												
	1 ship.	28,500												

‡ To be scrapped when replaced by West Virginia and Colorado. (See Table II.)

* Have been removed from the effective list.

TABLE VI.—AIRCRAFT CARRIERS.

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.	Launched.	Name.	Displacement.
1916	Furious	19,100	1920	*Béarn*	—				Converted 1921	Langley	19,360	1921	Hosho	9,500
1917	Argus	14,450								(formerly collier				
1917	Pegasus	3,070								Jupiter)				
1914	Ark Royal	7,080								*Lexington* *... ...	33,000		*Akagi* *	42,000*
1919	Hermes	10,950								*Saratoga* *			*Amagi* *	
1918	*Eagle*	22,790												
	6 ships.	77,440		1 ship.	—					3 ships.	85,360		3 ships.	93,500

* Designed as battle-cruisers; being converted to aircraft carriers under the Washington Treaty.

NOTE.—Vessels of which the names are printed in italics are under construction.

TABLE VII.—LIGHT CRUISERS.

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement
kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.
32	Courageous*	18,600	28½	**Metz**	5,300	28½	**Taranto**	4,480	35	*Omaha*	8,500	36	Natori	5,570
32	Glorious*			(*ex* Konigsberg)			(*ex* Strassburg)		35	*Milwaukee*		36	*Isudzu*	
33	*Emerald*	7,550	28½	Mulhouse	4,480	28	Marsala	3,518	35	*Cincinnati*		36	Yura	
33	*Enterprise*			(*ex* Stralsund)		28	Nino Bixio		35	*Raleigh*		36	Kuma	5,500
30	*Effingham*	9,750	27½	Strasbourg	4,842	28	Quarto	3,218	35	*Detroit*		36	Tama	
30	*Frobisher*			(*ex* Regensburg)		27½	Ancona	4,842	35	*Richmond*		36	Kitakami	
30	Hawkins		27	Thionville	3,444		(*ex* Graudenz)		35	*Concord*		36	Kiso	
29	Despatch	4,765		(*ex* Novara)		27½	Bari	4,320	35	*Trenton*		36	Oh-I	
29	Diomede		26½	Colmar	4,280		(*ex* Pillau)		35	*Marblehead*		36	Nagara	5,570
29	Durban	4,650		(*ex* Kolberg)		27	Brindisi	3,444	35	*Memphis*			Kinu	
29	Delhi			*Duguay-Trouin*	7,873		(*ex* Helgoland)		24	Chester	3,750		*Abukuma*	
29	Dunedin			*La Motte Picquet*		27	Venezia		24	Birmingham			*Kako*	7,100
29	Danae			*Primauguet*			(*ex* Saida)		24	Salem			*Furutaka*	
29	Dauntless					22	Libia	3,830	16½	Galveston	3,200		*Naka*	5,570
29	Dragon					16½	Campania	2,444	16½	Chattanooga			*Sendai*	
29	Capetown	4,190					*Two projected*		16½	Tacoma			*Jindzu*	
29	Cairo								16½	Denver			*Yubari*	2,300
29	Calcutta								16½	Des Moines		31	Tenryu	3,500
29	Carlisle								16½	Cleveland		31	Tatsuta	
29	Colombo											26	Yahagi	4,950
29	Cardiff											26	Hirado	
29	Coventry											26	Chikuma	
29	Curlew											23	Tone	4,100
29	Ceres												*Four projected*	10,000
29	Curacoa												*Two projected*	7,100
29	Caledon	4,120												
29	Calypso													
29	Caradoc													
29	Concord	3,750												
29	Centaur													
29	Cambrian													
29	Canterbury													
29	Constance													
29	Castor													

* These vessels, as their displacement reveals, are of a special class, but they are only lightly protected.

TABLE VII.—LIGHT CRUISERS (*continued*).

BRITISH EMPIRE.			FRANCE.			ITALY.			UNITED STATES.			JAPAN.		
Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.	Speed.	Name.	Displacement.
kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.	kts.		tons.
29	Champion	3,750												
29	Calliope													
29	Comus													
29	Conquest													
29	Carysfort													
29	Cleopatra													
29	Aurora (c)	3,500												
28¾	Vindictive	9,750												
26	Birmingham ...	5,440												
26	Lowestoft ...													
25½	Southampton ...	5,400												
25½	Dublin													
25½	Adelaide (A) ...	5,560												
25½	Yarmouth	5,250												
25½	Dartmouth													
25½	Weymouth													
25½	Brisbane (A) ...	5,400												
25½	Sydney (A)													
25½	Melbourne (A) ...													
25½	Chatham (N.Z.) ...													
	54 ships.	296,080		8 ships.	45,965		12 ships.	37,058†		19 ships.	115,450		29 ships.	175,280

(A) Australian Navy. (c) Canadian Navy. (N.Z.) New Zealand Government. † Tonnage of 2 projected ships to be added.

NOTE.—Vessels of which the names are printed in italics are under construction.

CHAPTER IV.

THE JUTLAND CONTROVERSY: AN HISTORICAL APPRECIATION.

IF anybody has the curiosity to turn to the official communiqués of the Battle of Jutland, and to the comments in the Press which followed them, it will hardly cause him surprise that it should have taken seven and a half years for the true facts to be extricated from such a tangle of mis-statements. On the other hand, those wild and inaccurate stories cannot be ignored. Like all legends their effect has been deep and lasting. Out of them the nation formed its most durable impressions of what had happened; the publicists who discussed the action during the years immediately following the war were profoundly affected by them, and their influence is traceable in what has been written by the expert naval critics of America, France, and Italy. What, then, were these fabulous stories, and out of what materials were they created?

THE FIRST COMMUNIQUÉ.

On June 3, the Admiralty issued its first report, and the opening sentences ran as follows: "On the afternoon of Wednesday, May 31, a naval engagement took place off the coast of Jutland. The British ships, on which the brunt of the fighting fell, were the British Battle-Cruiser Fleet, and some cruisers and light cruisers, supported by four fast battleships. The German battle fleet, aided by low visibility, avoided prolonged action with our main forces, and soon after these appeared on the scene, the enemy returned to port, though not before receiving severe damage from our battleships . . ." Then followed the admission that we had lost 3 battle cruisers, 2 armoured cruisers, and a considerable number of destroyers. As we said only that the enemy's losses "were serious," the nation received this announcement with feelings of utter dismay.

The depression caused by the announcement was deep, and the clamour for something more encouraging persistent. On the following day, therefore, the Admiralty issued a further report, which has had a far-reaching and enduring influence. It was to the effect that the Grand Fleet had come into contact with the German High Seas Fleet at 3.30 p.m. on the afternoon of May 31, and that the "leading ships" of both sides carried on a "vigorous fight" until the main body of the Grand Fleet came into contact with the German High Seas Fleet. After a brief engagement, the Germans had broken off the action and fled with our forces pursuing them. After "driving the enemy to port," Sir John Jellicoe returned to the scene of action and "scoured the sea" in search of disabled vessels. The communiqué closed with a statement that the German losses had been heavier than ours, "not merely relatively to the strength of the two fleets, but absolutely"; and a table of the German ships which we claimed to have sunk was added. It included 2 battleships, 2 battle-cruisers, 4 light cruisers, 9 destroyers, and a submarine.

EARLY LEGEND OF THE BATTLE.

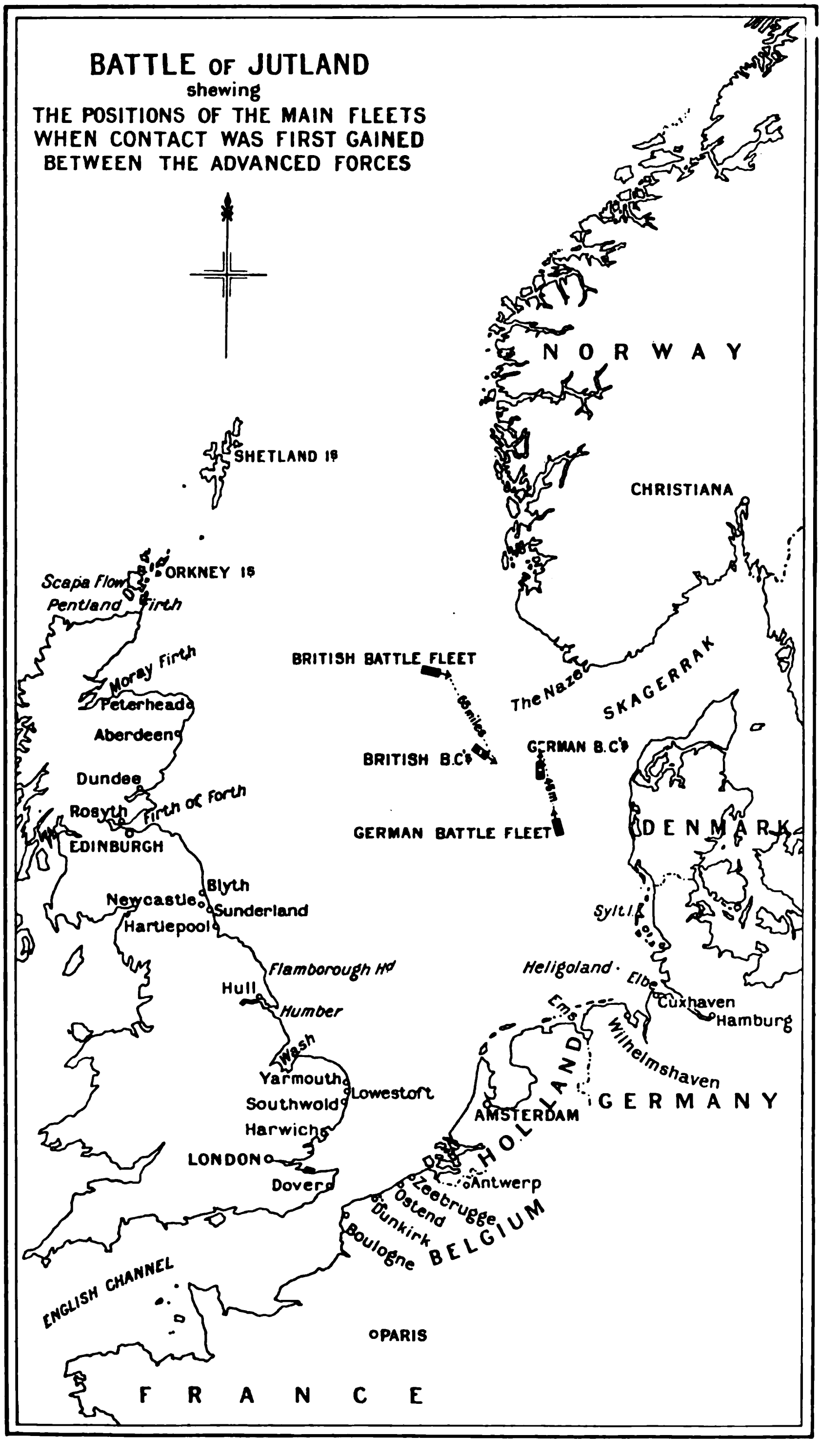
Out of this very misleading material there sprang up what may well be called the first legend of the Battle of Jutland. It ran roughly as follows: Sir David Beatty had fallen in with the whole mass of the German High Seas Fleet during the afternoon of May 31. Undismayed by the tremendous odds against him, he had flung his battle-cruisers against the enemy's squadrons, and had fought a delaying action until Sir John Jellicoe had time to come up. Our terrible losses had been incurred in this heroic and unequal contest; but, with the arrival of the main fleet, the tables had been completely turned, and the balance of loss reversed in our favour. The enemy had returned to his ports beaten, without order or cohesion; and our victorious fleet had "scoured" the North Sea after the triumphant fashion of Admiral Tromp.

A story like this was only credible for so long as the belief in the reported German losses lasted, and the Germans were in no hurry to admit their full extent. When once it became clear that our losses had exceeded theirs, the legend had to be modified. The second phase of criticism is very difficult to trace.

A CRITICAL ACCOUNT PUBLISHED ABROAD.

The credit for issuing the first critical account of the battle falls to a foreigner. In August 1916, a Swedish admiral published a narrative of the action in the Stockholm Press, based upon such materials as he had gathered and examined. He was impartial and reserved. He expressed no opinion as to the strategical significance of the battle, for he did not speak of it as a British or a German victory; but he did make several points quite clear. In the first place, he showed that our principal losses had been inflicted by a weaker enemy; that is, our battle-cruisers had suffered them whilst fighting against Admiral Hipper's scouting group, and not whilst they were engaged with the battle squadrons of the High Seas Fleet. In the second place, he did not believe that our claims were justified, and accepted the German statement of their own losses. In the third place, he was quite convinced that the German Fleet had returned to port in good order and without being pressed. On all the tactical details of the action he was necessarily very vague.

This account was, of course, accessible only to a few persons. It was translated in the "Summary of the Foreign Press," which, though it was strictly speaking an official and confidential publication, was fairly widely circulated during the war. Practically every Government official could get a copy to read if he wished; and it



BATTLE OF JUTLAND
shewing
THE POSITIONS OF THE MAIN FLEETS
WHEN CONTACT WAS FIRST GAINED
BETWEEN THE ADVANCED FORCES

was often communicated to the leading representatives of our own Press. The influence of the Swedish admiral's articles may, therefore, have been more far reaching than at first sight seems possible. So long as the war lasted, his account of the battle was the most accurate and reliable; and when, at last, the censorship was removed, the critical accounts of the action which began to appear, were probably based very largely upon his narrative. Be that as it may, the fact remains, that, when the better known naval publicists wrote upon the Battle of Jutland during 1919 and 1920, they did so on a tolerably accurate basis of fact. The circumstances in which the losses on both sides had been incurred were known, and the general character of the action between the battle fleets was grasped fairly clearly.

The Second Legendary Account.

From these sources sprang what may be termed the second legend of the Battle of Jutland. It differed very much from the first and ran thus. Our losses had been solely due to the bad construction of our ships: no question of leadership entered into the matter. On the other hand, the unsatisfactory nature of the main action had been solely due to the incapacity of the Commander-in-Chief. In the first place he had deployed his fleet *away* from the Germans, instead of *towards* them, and had thus thrown away his chance of pressing them decisively. In the second, he had turned his fleet away from a torpedo attack, which he ought to have ignored, and had thus allowed them to break off the action.

This was the position when Admiral Jellicoe's book appeared; and as the critics had already made up their minds on the whole question, they assured the public that the Commander-in-Chief's presentation of the facts only confirmed the views they had expressed. The public were, however, getting rather tired of the matter. They were far more interested in the general results of the action than in its tactical details; and they realised, with a good deal of amusement, that the discussion was becoming extremely personal. The Navy was obviously divided into two parts; and the rivalry of the opposing factions was not a national concern.

A New Problem and its Consequences.

A curious chance brought the real issues to the front once more. Whilst expert and quasi-expert writers were discussing the qualities and defects of our naval commanders, the nation was suddenly presented with a more vital problem. A number of experts of high authority began boldly to advance the view that battle fleets were no longer the base upon which the structure of sea power should be erected. Submarines and air fleets were destined to drive them from the sea; and any maritime state which expended its resources on the construction of battle fleets was simply placing its destiny at the mercy of a more prescient rival. The implication was obvious. Whichever party was in the right, the first necessity for framing a well-founded judgment was to be in possession of all the facts relating to the last occasion on which great battle fleets had been engaged. The indirect result of the controversy was, therefore, a clamour for a full account of the Battle of Jutland, which was silenced by the official publication known as the Jutland Papers.

It was a very effective answer to the group of publicists who had expended so much time and thought in attacking the Commander-in-Chief, for they had neither the time nor the knowledge to analyse such materials. They ignored them in angry silence, and the discussion now passed into more expert hands. Lieutenant-Commander Gill, of the American Navy; Capitaine de Vaisseau Richard, of the French Navy; and Lieutenant-Commander Ichiro Sato, of the Japanese Service, were the most important commentators.

These officers, it is true, did advance certain definite opinions about the manner in which the action was conducted; but they did so in a tentative fashion. The real merit of their writings consists more in the questions which they raised, but left unsettled, than in the problems for which they found an answer. They decided that, in the opening phases of the action "something seemed to have been desired as regards concentration"; that the British battle fleet had been very cautiously used; but that the much-discussed deployment of Admiral Jellicoe's squadrons was far less important than had been supposed.

It is therefore the business of any person who discusses the lessons to be drawn from the action, which is now known to us in all its details, to answer, one by one, the questions which have been raised during the last seven years.

THE REAL POINTS AT ISSUE.

The first point at issue is possibly the one which interests the greatest number of people. What was the strategical significance of the battle? Were we defeated or victorious; and does the Admiralty's triumphant communiqué about our battle fleet scouring the seas represent any real achievement? In answer to this, it can be said at once that very little hung upon the German project. When Admiral Scheer put to sea on May 30 his intention was simply to steam to the mouth of the Skagerrak and then return to port. Had he been allowed to do so without interference, the course of the naval war would not have been altered. A few neutral and British merchantmen would have been condemned in the German prize courts; and the German Fleet would have successfully carried out the kind of sortie which, in all ages of history, it has been within the power of the weaker party to execute. A dozen submarines operating in the same area, would have disturbed the flow of our Scandinavian trade much more and for a considerably longer time.

A TIMID PROJECT.

Admiral Scheer's plan was not, therefore, of a kind which either challenged or tested the existing position at sea. He left harbour admitting tacitly that the Grand Fleet dominated the sea communications of the belligerent Powers; and when, after the battle, he drew up his report to the Emperor, he was careful to say that the situation was unaltered. We continued to derive all the advantages which had accrued to us since the war opened by virtue of our more powerful fleet: the enemy made the same very restricted use of his fleet as he had hitherto done. We carried on the war overseas unchecked: our vital sea communications on every sea and ocean continued free from serious menace by enemy surface craft; but the Germans, with their submarines and shore artillery, prevented us from carrying out major operations in the Heligoland Bight. In other words, the terms victory and defeat do not apply to the Battle of Jutland as a whole; but if we deal separately with the component parts of that generic term, we are entitled to say that in the first part of the action Admiral Hipper out-fought and defeated the forces to which he was opposed; and that in the second, Admiral Jellicoe completely out-manœuvred and thwarted his antagonist.

THE CONSEQUENCES OF SCOURING THE SEA.

At first sight, our pride in having been able to scour the sea in search of disabled vessels and to remain on the scene of action on the morning after the battle seems meaningless. In the eighteenth century, when squadrons held positions at sea during every month in the year, it was undoubtedly a very real achievement if, after an action, one squadron was driven to port whilst its opponent kept the sea; but in the year 1916, when a battle fleet could only remain away from port for so long as the fuel of its destroyers lasted, it would seem as though it was of no importance at all that Admiral Jellicoe should have remained in the southern part of the North Sea a few hours longer than Admiral Scheer. Had our fleet been steering for the Orkneys when the Germans were making for the Horn Reefs channel, nothing would have been different.

The matter is, however, not quite so simple; for it is now known that a sortie of the High Seas Fleet might have been made to cover a very serious operation in the Flanders Bight, and that a force of old German battleships and cruisers might have operated with very great effect in the Downs and the Thames; whilst the High Seas Fleet held our main squadrons in the central part of the North Sea.

The German High Command did not use their opportunities; but, as the danger was always present in our minds, and, as it profoundly affected our dispositions on the day of the battle, it might have been of enormous consequence that Admiral Jellicoe should have remained at sea during the morning of June 1; whilst Admiral Scheer returned to harbour, leaving his force in the Flanders Bight without support. In point of fact it mattered nothing, but that does not alter the significance of what occurred.

THE BATTLE-CRUISER ACTION.

It is beyond all doubt that the events which took place between half-past two and five o'clock in the afternoon of May 31 are without historical analogy. Weaker squadrons have from time to time gained some advantages in a fleet action; but there is no precedent at all for a British squadron superior to its opponent in speed and gun-power being outfought and defeated in fifty-three minutes. There is, in this, a significance which posterity will dwell on when Admiral Jellicoe's deployment has been forgotten; and it is thus a matter of the most vital importance to examine every possible explanation of the disaster—the destruction of two battle-cruisers and other losses suffered in the early phase of the action.

The facts are so well known that they can be related in their barest outline. At about twenty minutes past two, on the afternoon of May 31, Admiral Beatty became aware that there was an enemy force to the east of him. For nearly an hour he moved on various courses towards his opponent, of whose position and strength he was ignorant; and it was not until nearly half-past three that he knew for certain he was confronted with Admiral Hipper and his two scouting groups. At about a quarter to four the action opened. It was fought on courses which alternately diverged and closed, until, between half-past four and five o'clock Admiral Beatty became aware that the whole High Seas Fleet was to the south of him, and turned north. During that period two of his battle-cruisers were reduced to a mass of smoke and rubbish; but, as far as we know, his antagonist's squadron was very little damaged.

THE CAUSES OF THE LOSSES.

Before dealing with the circumstances in which these calamities occurred, we should first be quite clear whether they were in any way attributable to the opening movements of the two opposing squadrons. The most cursory inspection of the manœuvres preceding the battle make it quite evident that the movements of the various sections of the Battle-Cruiser Fleet were not co-ordinated. The screen of light cruisers to the eastward of the Lion moved automatically towards the north-eastern end of the line as soon as the Galatea and Phaeton became engaged. All of them, except the ships of the Second Light Cruiser Squadron, seemed to consider that from the moment contact was obtained, the duty of supporting the vessels which they knew to be in action superseded that of making a complete reconnaissance. The commander of the Third Light Cruiser Squadron made it quite clear that this, in his opinion, was his primary duty, by informing Admiral Beatty that he was closing the Light Cruiser Squadron on his port wing. As he received no answer, he assumed, with good reason that his action was approved. Scouting forces must always have the double duty of obtaining information and of preventing the enemy from doing the like. As the first is generally carried out by manœuvre and the second by fighting, it is always possible that a reconnaissance group may not be able to do both things simultaneously, in which case one duty must be given priority over the other. It would seem as though the general rule in the British Service had been that scouting forces were to engage similar enemy groups whenever they could; which means that they are to scout in order to fight. We cannot be certain of this, as the general instructions under which the light forces were acting have never been published; but it is more or less permissible to assume that this was their governing doctrine. Whether, theoretically, it was right or not, the consequences were remarkable; for Admiral Beatty was left to locate his main opponent with his battle cruisers, and was compelled to judge, by guesswork, what courses were best calculated to cut off Admiral Hipper from Horns Reef and at the same time bring him to action. All chance of choosing the position from which he should engage was thus denied him, and the very great superiority of his force in light cruisers was thrown away.

Unco-ordinated Movements.

But if the reconnaissance ships worked with little regard to the forces for which they were scouting, the lack of co-ordination between the striking divisions of the Battle-Cruiser Fleet was more remarkable still. Between 2.20 and a quarter to four the battle cruisers made a considerable number of very important alterations in course, and in no instance were they properly communicated to the commander of the Fifth Battle Squadron (Queen Elizabeth). This officer, with a slower force under his orders, was left to judge of Admiral Beatty's movements by what he could see of them, and to conform as best he could. The result was only what would be expected: when the action began the battle-cruisers and their supporting battleships were not concentrated, and Admiral Beatty confronted his opponent with less than half his available striking force.

It can thus be seen how inadequate are all the current explanations of the disasters which overtook the battle-cruiser fleet. Every commentator on the battle has written of them as though they were utterly unforeseeable tragedies, which had no relation to anything that preceded or followed them. Their origin has never been connected to the tactics or conduct of the action, and they have been judged simply as things in themselves. Now, although it is beyond all doubt that the loss of the battle cruisers is very closely connected with certain technical questions, which have nothing to do with manœuvres or tactics, the matter must not be examined in the light of those considerations alone. Two points must be borne in mind in any analysis of the disaster: firstly, that the exact circumstances in which these tremendous calamities occurred—that is, the range and bearing upon which the German gunners fought us with such deadly effect—were the outcome of preliminary movements which might have been quite different under another system of command; and, secondly, that the dispersal of striking force which left the Fifth Battle Squadron out of the action when the Queen Mary and Indefatigable were destroyed was avoidable.

Against this it will be said: granting that the close range at which the battle-cruiser action was fought turned to our disadvantage; and granting, also, that if all sections of the Battle-Cruiser Fleet had been more concentrated when the engagement began, the result might have been different, this line of criticism amounts to no more than being wise after the event. On the afternoon of May 31, 1916, the commander of the Battle-Cruiser Fleet had no reason to doubt that he could successfully engage the First and Second Scouting Groups of the enemy without assistance, and press them to close action, relying for victory upon the very great superiority of his broadside. That criticism of the preliminary movements does not disprove that the disasters were unforeseeable. This objection can only be met by examining what occurred when the Battle-Cruiser Fleet was previously engaged with Admiral Hipper.

THE DOGGER BANK AND ITS LESSON.

Early in the morning of January 24, 1915, Admiral Beatty's force fell in with the First and Second Scouting Groups of the enemy in the central part of the North Sea, and just before 9 a.m. opened the battle of the Dogger Bank at a very long range. The action resolved itself into a stern chase, and the distance between the two squadrons decreased very slowly. We only rarely hit the Germans, for, if we leave out of the reckoning the concentration of fire on the Blücher towards the close of the action, the German ships were only struck four times. Of those four hits only two were effective. Being fired at long range they struck the German ships at a sharp angle of descent, and fell upon their decks with tremendous effect. One of them left the Blücher incapable of manœuvring (*manovrier unfähig*); the other wrecked the after part of the Seydlitz and caused over a hundred deaths. The other two hits did very little harm. Whilst we were sending down this very ineffective fire, we were quite persuaded that we were doing great damage. One of our harmless shots had set several boats on fire in the Derfflinger, and we concluded from the clouds of smoke which went up that the enemy ships were being severely punished.* Towards ten o'clock the stern chase had reduced the range, when the German fire became very effective. No exact list of the hits we received has ever been published, but we can be fairly safe in concluding that our vessels were struck between twenty and thirty times. The result was, as is known, that the Lion was put out of action, but that we destroyed the Blücher at close range, thanks to the lucky plunging shot in the early part of the action, which had caused her to lag behind her consorts.

In this action about five years of naval theory was put to the test. We had built the battle-cruisers on the assumption that their speed would enable them to choose a range at which they would have an advantage, which their superior gun-power would enable them to make decisive.† The action proved that accurate gunnery would be so difficult at the long distances at which our big calibre guns could best assert their superiority, that the advantage gained would not be decisive; that, at lower ranges, the German gun-fire was likely to be very damaging; and that the gunnery of the enemy's battle-cruisers, a matter of careful training, was superior to ours. The full facts could not be known, and very wrong inferences were drawn from the incomplete evidence at our disposal. Mr. Churchill announced in the House of Commons that the action proved our ships to be better designed, our bursting charges to be more effective, and our gunnery to be better than the enemy's: the truth was the reverse in every particular.

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* See "Naval Operations," vol. ii., by Sir Julian Corbett, pp. 101, 102, and "Der Krieg zur See, Nordsee," Band 3, p. 236.

† This, at all events, is the construction that may justifiably be put upon Lord Fisher's letter to Mr. Churchill, printed on p. 140 of the "World Crisis." "The first of all necessities is speed, so as to be able to fight when you like, where you like, and how you like."

The Destruction of the Battle-Cruisers.

For this reason it cannot be said that the defeat of our Battle Cruiser Fleet at Jutland was unforeseeable. We had at our command a mass of facts, which, if read properly, would have warned us that we should run into very great danger by pressing the enemy's First Scouting Group to close action; and that it would be very difficult to strike our opponent a rapid, crushing blow with the weapons that we had forged as the Battle Cruiser Fleet had learnt to use them.

But the contention of those who argue that the loss of the Queen Mary, the Indefatigable, and the Invincible was due purely to technical questions of design and high explosives is not yet answered. They point to the fact that at Jutland our ships exploded when hit, and that, under the very severest punishment, the German vessels never did so. There is a very great deal in this; but, on inspection, the cause will be found to lie more in the fortune of war than our faulty construction.

As has already been said, a plunging shot hit the after part of the Seydlitz in the early part of the Dogger Bank action and did enormous damage; the explosion and the fires which it started burnt away over 6,000 kilograms of cordite in a few seconds. Those on the spot did not see how an enormous internal explosion, which would have destroyed the ship, could possibly be avoided. But just as Major Harvey saved the Lion from destruction at the battle of Jutland by flooding the magazines in the nick of time, so in this critical moment Korvetten Kapitän Hagedorn and two German bluejackets let the water into the burning compartments. Had they done so a few seconds later, the Seydlitz would undoubtedly have exploded just as our battle cruisers did.*

The Wisdom of Experience.

As it turned out, this experience proved of enormous value to the Germans. The Seydlitz did not explode, and was safely docked in Wilhelmshaven after the battle. Her after compartments became little less than a well-fitted laboratory for the study of high explosives. The German experts had before them a complete register of the immediate and secondary consequences of an explosion in confined spaces, and were able to devise measures for localising and containing them. We had no such data upon which to work, as none of the hits on the Lion at the Dogger Bank were in any way comparable to the plunging shell which fell through the decks of the German flagship and produced such havoc. The result was that the Germans were able to devise protective measures against the spread of explosions owing to jets of flame and local temperatures, before the battle of Jutland was fought; whereas we were not in possession of a similar experimental equipment until afterwards. *In bello multum potest fortuna.*

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* "Während sie das Achterschiff in feurige Lohe einhüllten, glaubte jeder, das in wenigen Sekunden die Geschosse zur Detonation kommen und das Schiff in die Luft fliegen würde."—"Krieg zur See, Nordsee," Band 3, p. 212.

An examination of all the circumstances which bear upon the loss of our battle-cruisers leads us, therefore, to the following conclusions:

(i) The disasters were not isolated misfortunes. They are related to a system of battle tactics which might have been different. Our squadron engaged the enemy without concentrating its full force and after an incomplete reconnaissance. Had we massed our whole force, the result would certainly have been different; had we chosen our range with more regard to the peculiar qualities of our ships, it might have been.

(ii) We had before us an experience of war, which might have warned us that it would be very risky to press in to close action with the enemy, without securing a preliminary advantage at long range; but,

(iii) we had not the means of taking a precise measure of that risk; and the enemy had.

CRITICISM OF ADMIRAL JELLICOE.

Just as critics have separated the disasters to the Battle-Cruiser Fleet from the rest of the action, so they have written about the Commander-in-Chief's tactics, as though they, too, were quite unaffected by what happened earlier in the day. Discussion has been riveted on the method of deployment, and the conduct of the battle squadrons when they were attacked by the German torpedo flotillas; and these events have been discussed as though they were isolated, disconnected matters. But, as it is quite obvious that Admiral Jellicoe's movements were very largely conditioned by the information in his hands, and by his general scheme of battle, some preliminary inquiry must be directed towards the circumstances in which his much-criticised movements were made.

In the first place, we must be quite clear about the relation which the battle-cruisers bore to the Grand Fleet. It is evident to those who study Sir Julian Corbett's history that the Rosyth force had two distinct duties: to protect the coast against raids, and to be an advanced force for the Grand Fleet. It was acting in its first capacity when Scarborough and Whitby were bombarded and when Hipper moved to the Dogger Bank in January 1916; but it was purely a reconnaissance group on May 31. All our squadrons were then making for the Danish side of the North Sea, and there seems to have been no thought of a raid except, possibly, in the Flanders Bight. Now the duty of a reconnaissance force is independent of its composition; for whether it be made up of light craft only, or of light and heavy craft acting together, the task before it is to keep the similar enemy forces from interfering with the main body, or from getting any information about its movements and position; and, after containing or diverting any reconnoitring forces of the enemy that may be met with, to discover, as closely as can be, where the enemy's main body is, and what it is doing.

These were the duties of the Battle-Cruiser Fleet on May 31, 1916; and up to a certain point they were performed to the letter. Firstly, had Admiral Hipper been allowed to pursue his northward course after we discovered his presence, he would, undoubtedly, have fallen in with the advance screen of the Grand Fleet in an hour or two, and have reported that Admiral Jellicoe was at sea. Our battle-cruisers turned him back and so prevented the German scouting groups from interfering with our movements or suspecting our whereabouts. Secondly, though quite unaware that the High Seas Fleet had left the Jade, Admiral Beatty located it at about half-past four, and kept touch with it for the rest of the day. These are very positive results, and had they been fully communicated, it might have affected the later phases of the engagement.

Admiral Jellicoe not kept Informed.

This information was not communicated, promptly and fully, and the Commander-in-Chief was left to make his final dispositions for battle on very scanty and confusing data.

At four o'clock, Admiral Jellicoe knew that the Battle-Cruiser Fleet was in action with the First Scouting Group of the enemy on a southerly course; later he was told, in reply to a direct question, that the 5th Battle Squadron was in action. Shortly before five, he was aware that Admiral Scheer was to the south of him steering north. These were the general results of the battle-cruisers' reconnaissance; it was now of the last importance to elaborate the information obtained; and here there was failure. At half-past five visual contact was obtained between Admiral Beatty's light cruisers and the starboard wing of the battle fleet (Jellicoe); and though this enabled the Commander-in-Chief to locate his own battle-cruisers, he was still ignorant of the position of the enemy's fleet. He did not know it for a certainty until a quarter-past six, when it was reported at an unknown distance to the south of him, right across the course of his starboard wing squadron; and in these circumstances it fell to him to decide what movement was best calculated to bring the enemy fleet to action at an advantage to himself.

The Deployment of the Battle Fleet.

If that movement is to be understood, it is obviously necessary to examine what advantage it was that he sought, and his loyalty and reticence have made this a very difficult question. In his book

"The Grand Fleet" he gave no details of his tactical conceptions, thinking doubtless that he had better not say anything about the system of training on which the British Navy had been drilled. He has never explained how he thought the Grand Fleet could best engage their opponents, and has referred, very briefly, to his battle orders and fleet instructions without divulging them, presumably because he assumed that the Admiralty would regard them as confidential though the war was over. Seeing how much criticism he might have answered by doing so, one is compelled to admire his self-restraint and dignity; but they do not make an examination of his tactics easy. In fact, a full analysis of how he conducted the Fleet between 6.15 and 8 p.m. on May 31, still rests on a certain amount of guesswork. None the less, his movements do correspond to a deliberately chosen tactical plan, which must be explained as briefly as possible.

TWO SYSTEMS OF COMMAND.

A fleet may engage another on one of two systems. It may either be directed by one single mind, which orders and controls everything; or it may be divided between a number of subordinate commanders who co-ordinate their movements but act independently: this second system is known as divisional tactics. It was very much practised in the seventeenth century, and afterwards fell out of use. An attempt to revive it was made by the Japanese at the battle of Tsushima; but it led to very great confusion, and was realised to be a risky experiment. None the less, a number of British naval officers were convinced that a modern line of battle was so long and unwieldy that the command of a fleet must be decentralised in battle, and the whole question was thoroughly tested in the years preceding the war. The results have never been made known; but we can safely conclude that the whole conception was found impracticable; for we can find no trace of it in all the orders and signals issued by the Commander-in-Chief at Jutland. Quite the contrary—from first to last he gives tactical commands to the whole fleet; regulates the course of every battleship by a single signal, and controls the movements of every battle squadron under his orders. We can therefore say, with certainty, that the system of battle tactics based on a central, undivided command was the one which had been found upon examination most likely to give decisive results.

Now it is the essence of any plan, whether by land or sea, to ensure that one force shall be in greater strength than its opponent at a certain point; so that under the system which we adopted, it fell to the Commander-in-Chief to devise a tactical combination which should ensure, as far as could be, that the German Fleet, if met, should always be faced by some kind of concentration against which it would be powerless. Many solutions to this problem have been suggested; but the one which Admiral Jellicoe seems to have adopted was, to manœuvre his fleet in a single line to within gun-range of his opponent; and to do so in such a manner that every vessel would be engaged. The result would then be that, as twenty-four British would be engaging sixteen German Dreadnoughts, several vessels in the enemy's line would be under the fire of more than one British ship. In this manner the perennial problem of local superiority would be solved. This tactical method depended for its success upon the gunnery arm: those twenty-four British Dreadnoughts must be free to bring the whole weight of their broadsides to bear: they must do so at a range which would give them the advantage; and above all, they must be free from interference. Their superiority in gun-power must be allowed to develop its effect without the slightest disturbance; so that the blow struck would be dealt with such a calculated certainty, and such obliterating violence that no effective answer would be possible.

THE DESIDERATA OF VICTORY.

For this three things were necessary: firstly, the battle line must be formed at such a distance from the German fleet as to be out of torpedo range; secondly, it must be so far from it that our comparatively weak armour would resist the German 12-in. shell, whilst our heavier projectiles fell upon their ships in a cascade; and thirdly, our flotillas must be in a posture to beat off any attempt of the enemy's destroyers to harass or throw out our tactical plan.

These three points must be clearly borne in mind if the Commander-in-Chief's method of deployment is to be comprehensible at all. They are at once the key to the principles of leadership under which he acted, and a reply to a good half of the criticism which has been directed against him. For, if we wish to form a right judgment upon his method of leadership, the question to decide is simply how far it conformed with the plan upon which he relied for victory, and to what extent his deployment helped him to secure the tactical advantage which he was seeking. In other words, it must be judged by its consequences.

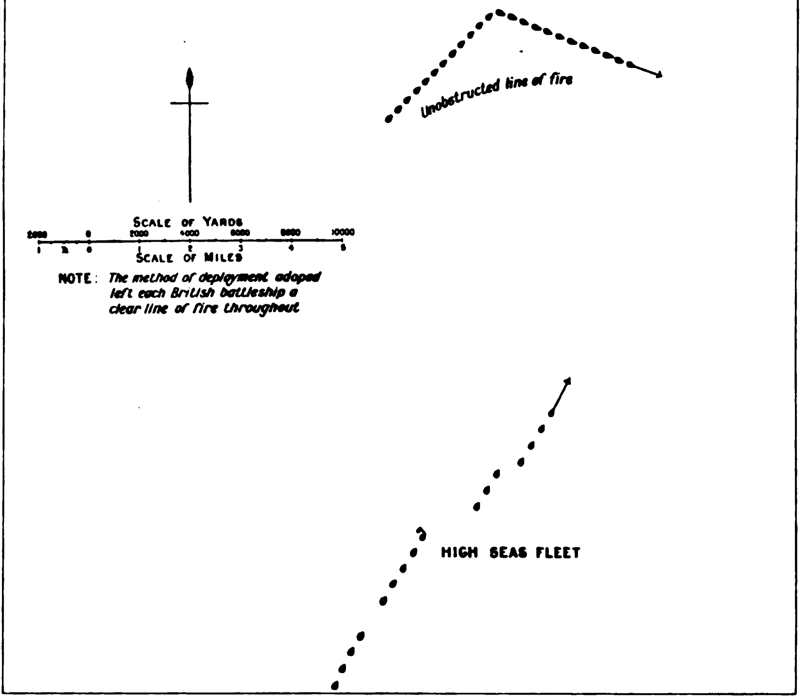
At about a quarter-past six, Admiral Jellicoe, acting on the scanty and confusing messages he had received from his advanced forces, decided to deploy on his eastern division. About ten minutes later, his ships were in line ahead, with the three leading divisions steering about E.S.E., and the remainder steering north-eastwards to take up their positions astern of the leader. Due south of the centre of our line was Admiral Scheer's leading division. Our van was about 14,000 yards from the enemy, our centre 17,500, and our rear 13,000. Although haze and funnel smoke made continuous firing impossible, we then held the leading German division of four ships under an intermittent, but converging fire from nearly twice that number of British Dreadnoughts. In other words, within ten minutes of his fateful decision the Commander-in-Chief was bringing down a crushing concentration of fire upon his opponent; and could be certain that every minute would increase his advantage, for our vessels were hindered by the light, and not by their position; whilst the enemy could not hope to get his whole battle line into action for at least a quarter of an hour. The distance of our line from theirs was certainly rather less than would have been chosen had a deliberate choice been possible; as torpedo firing can be dangerous at 13,000 yards. On the other hand, the advantage in the tactical position was entirely on our side; as, in the first moments of the engagement, we had confronted about a third or a half of the enemy's battleships with the whole of our effective strength. The result was simply what was to be expected: within ten minutes, the whole German Fleet was withdrawing from the blast of our gun-fire. No battle is ever fought exactly *secundum artem;* but there is in Admiral Jellicoe's deployment a conformity between design and execution which is reminiscent of the finest combinations of Turenne and Marlborough. On a handful of scrappy and confused reports, he had secured to himself practically every advantage for which he was striving.

THE DEPLOYMENT AND ITS CONSEQUENCES.

We have now to examine the criticism which the Commander-in-Chief's assailants have advanced against him. They have insisted that by deploying differently he would have brought his line closer to the enemy at the beginning of the action. The answer to this is twofold. No alternative system of deployment would have enabled the whole of our line to engage as soon as it did; for, whether the deployment were made on the right wing or on the centre, only the leading division would have been in action until the manœuvre was completed; as it was, every one of our ships was in a position from which it might have engaged, but for the haze and funnel smoke, whilst the movement was actually in progress. Secondly, it was precisely this close initial action which Admiral Jellicoe wished to avoid, as it would have thrown away the advantages that he was seeking, by making the enemy's gun-fire as effective as his; and by giving them every possible opportunity for throwing out and confusing the plan which he had deliberately chosen. The criticism of the Commander-in-Chief's assailants is, therefore, no criticism at all; but mere lack of comprehension. His movements between 6 and 8 p.m. are unintelligible if considered apart from the plan upon which he was working; and it is precisely because his critics have examined the one and ignored the other, that their contentions are almost meaningless to instructed naval opinion.

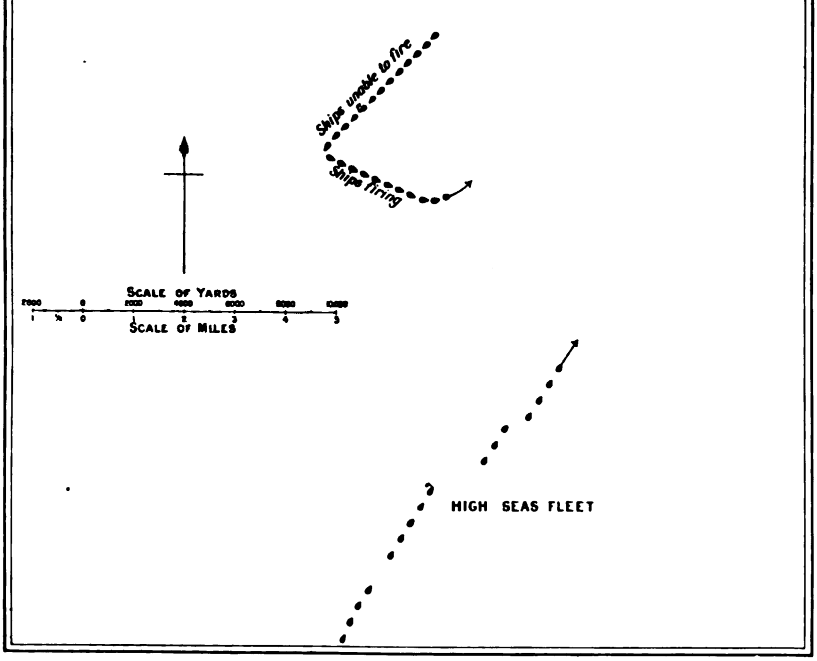
Against this it will probably be said: Granting that Admiral Jellicoe's method of deployment was the logical consequence of his tactical scheme, a plan which gives so little result must be very faulty. It only brought the Grand Fleet into action for a few minutes between about 6.20 and 6.35; and again between about 7.10 and 7.20. Apart from that, if it was the Commander-in-Chief's intention to engage without fear of disturbance from torpedo attack, he was not very successful, as he turned his entire fleet away from two half flotillas, which discharged, in all, rather over twenty torpedoes, and so broke off the action.

DIAGRAM SHEWING CONCENTRATION OF FIRE DURING THE DEPLOYMENT



NOTE: *The method of deployment adopted left each British battleship a clear line of fire throughout*

SHEWING CONSEQUENCES OF ALTERNATIVE METHOD OF DEPLOYMENT



TORPEDO TACTICS IN BATTLE.

The first objection involves very wide issues; the second is purely technical, and may therefore be taken first. It reduces itself to a very simple question. Is there any possibility of engaging an enemy at so great a distance that torpedo attack will be impossible? This depends upon two things: (i) the greatest range at which heavy-calibred guns can keep up an effective fire; and (ii) the range at which torpedoes can be fired effectively, and the distance which flotillas can cover whilst under fire without being crushed by the medium-calibre guns and the light cruisers of the squadron they are attacking. With regard to the first, experts will answer that, though accurate firing may be possible at 18,000 yards in the clear atmosphere of the Mediterranean, the hazy, uncertain light of the North Sea so reduces the stereoscopic effect at long ranges that it is useless to hope for good gunnery at greater distances than 15,000 to 16,000 yards. In ordinary conditions it will be necessary to close in even more, to ensure accurate firing. With regard to the second, the flotilla expert will say: Although we can fire our topedoes with a fair chance of getting them home at distances of 15,000 yards, we should none the less press in to about 10,000 or 12,000 if we could; and we should always hope to do so if not more than ten minutes elapsed between when we first came under fire, and the time our torpedoes were discharged. If it takes longer than that to launch our attack, we shall probably be overpowered before it is delivered.

These facts in themselves supply an answer to the question raised: if a torpedo attack can be delivered from the greatest range at which an action can be fought decisively, there is obviously no means at all of giving a battle line complete immunity from it. Apart from that, as it does not take a modern destroyer ten minutes, or anything like it, to close from 15,000 to 10,000 yards, a battle line is necessarily very seriously exposed to torpedo attack from the time an engagement begins. No tactical plan can in itself give protection from it: all that can be done is to devise a scheme which reduces the danger to manageable proportions, and adhere to it.

When, therefore, Admiral Jellicoe turned his fleet away from the attack delivered by the 17th and 11th half flotillas of the German High Seas Fleet between 7.20 and 7.25, he was simply manœuvring against a danger which was a commonplace in battle tactics. His action can, therefore, only be judged fairly by seeing what other commanders did in similar circumstances. If others contrived, in the press of a like danger, to keep their battle line on its course, the Commander-in-Chief's action may be said to have been over-cautious. If not, he was obviously only doing what every experienced commander would have done.

ADMIRAL JELLICOE'S TURN AWAY.

Let us, therefore, set out, specifically, every recorded instance of the manner in which commanders of squadrons handled their ships in the presence of destroyer attack:

(i) During the Dogger Bank action, it appeared to Admiral Beatty, at about 9.40, that the German destroyers meditated an attack: almost at once he made two turns *away* from the Germans (Sir Julian Corbett, "Naval Operations," vol. ii. Chart No. 3).

(ii) In the same engagement, Admiral Beatty ordered his squadron to turn eight points *from* a reported submarine. The movement was executed, and the action broken off in consequence (Sir Julian Corbett, "History of Naval Operations," vol. ii. pp. 95, 96).

(iii) When the 13th flotilla attacked Admiral Hipper's squadron just before 4.30 p.m. in the first phase of the battle of Jutland the enemy eturned *away*, in all, about eight points and his ships ceased fire ("Battle of Jutland, Official Despatches," p. 591, and plan, "German IV").

(iv) Ten minutes later, the commander of the 5th Battle Squadron turned *away* from the German line to avoid torpedoes ("Battle of Jutland, Official Despatches," pp. 193, 452).

(v) At 4.50 p.m. Admiral Hipper turned *away* from a destroyer attack which he thought was about to occur ("Battle of Jutland, Official Despatches," p. 593).

(vi) Just after six o'clock Admiral Hipper turned from 6 to 8 points to avoid the attack of four British destroyers.

(vii) At 6.15 p.m. Admiral Sir Horace Hood turned *away* from the enemy to clear his squadron from a torpedo attack ("Battle of Jutland, Official Despatches," p. 458).

(viii) At 7.13 Admiral Sir Doveton Sturdee felt it necessary to turn the 4th Battle Squadron *away* from the enemy to avoid torpedo attack, although it was at the moment in Admiral Jellicoe's deployed battle line ("Battle of Jutland, Official Despatches," p. 463).

From these examples, there is only one conclusion possible: when our battle squadrons were turned away from the enemy's destroyer attack between 7.20 and 7.30, the movement was simply a recognised counter to a known danger. The only difference between the German and the British practice seems to have been that, in like circumstances, their turns were roughly double ours.

CRITICISM AND FACT.

Once again it can be seen how dangerous it is to judge of naval tactics by generalities and abstract reason. No manœuvre has been more fiercely criticised than this turn away by the Commander-in-Chief. Some writers have striven to decide whether it implied "Nelsonic" conduct, and whether Admiral Jellicoe displayed an "unalterable will to victory"; another critic has decided that Admiral Jellicoe was animated by a cautiously offensive spirit. Discussion on these lines is of no use to anything but a vocabulary of catch-words and jargon. There is only one way of judging of the leadership of our Fleet. Every significant action, movement, command, or general disposition must be placed in its proper context. Just as it is impossible to judge of a book by quotations, so tactical problems have to be reinstated into the circumstances out of which they sprang. They cannot be separated from what went before or after them, or from the general stock of military knowledge and experience which was focussed on their solution.

THE INFLUENCE OF THE BATTLE FLEET.

One point remains to be considered: why the action was so indecisive? Stated in these precise terms, the question is a little misleading, as it leaves a very relevant point unstated. During the whole day it was only during the moments when the Battle Fleet was engaged that the fighting went decidedly in our favour. If we take it that the Battle Fleet was in action for about thirty-five minutes in all, we must remember that during that brief period it inflicted damage at a rate which Admiral Hipper himself could not equal. If he could claim to have destroyed two British battle-cruisers in fifty-three minutes, Admiral Jellicoe can claim to have totally destroyed one German battle-cruiser, to have disabled two more, and to have damaged three battleships in about half an hour. It is quite true that he was not able, on that account, to force a decisive action; but such a statement must, in justice, be put on record as a register of the positive results he achieved.

It has, however, to be admitted that the whole question cannot be very rigorously treated. The naval war from 1914 to 1916 was not eventful in fleet engagements, but those which occurred supplied a stock of facts in the light of which the matters hitherto discussed have been examined. Jutland was the only fleet action in the war, and there is no means of ascertaining whether, under another system of command, it might have been more decisive; simply because there is nothing with which it can be compared. Those most competent to judge say that, in the hazy atmosphere which prevailed, there was no means of pressing the enemy more than we did. Admiral Jellicoe states that the reason was more deep-seated. "Nothing but ample time and superior speed can supply an answer" (to the German Kehrtwendung movement), "and this means that unless the meeting takes place fairly early in the day, it is most difficult, if not impossible, to fight the action to a finish." * This deals finally with all technical questions. Had other fleet actions occurred, the Commander-in-Chief's opinion could be tested: as it is, it must be allowed to stand, simply because it is the considered judgment of the highest available expert. Jutland cannot be compared with Tsushima—the conditions are too unlike: still less can it be compared with Trafalgar, though some have had the folly to try. It is just as stupid to ask whether Admiral Jellicoe's conduct was Nelsonic as it would be to say that Lord Haig was not so good a general as King Henry V., because Agincourt was decisive, and the battle of the Somme was not.

SIGNIFICANCE OF THE ACTION.

None the less, something can be ascertained about the significance of an action by replacing it in its historical setting. Certain prin-

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* Sir John Jellicoe's despatch, 18th June, 1916; "Battle of Jutland, Official Despatches," p. 3.

ciples of war outlive the centuries; and if naval history be read aright it can only lead to the general conclusion that when two fleets approximately equal in efficiency, equipment, seamanship, and numbers meet in battle the result is likely to be indecisive. This, at all events, is the lesson of the Dutch and French wars of the seventeenth and eighteenth centuries. We gained advantages over Tromp and de Ruyter, and on several occasions they claimed the victory; but there were no Trafalgars or Aboukirs. Again, so long as the French Fleet was maintained at a standard of efficiency equal to ours, we were never completely its masters:* it was only when the Governments of Louis XV. and the Revolution undermined its discipline and equipment that the tremendous disasters of Quiberon Bay and Trafalgar overtook it. In modern times, Admiral Rashdesvensky's squadron could not compare with its opponents in equipment or training. In other words, history seems to register a very strong caveat to the popular conviction that, in naval war, a fleet is doomed to certain, overwhelming, destruction if it meets an adversary of greater numerical strength. It may, therefore, be doubted whether Admiral Jellicoe's superiority in Dreadnoughts would have enabled him, in any circumstances at all, to force a final, crushing decision upon Admiral Scheer during two short hours of failing light.

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* The Battle of the Hogue is a good example. For a whole day Tourville gave battle to a very superior fleet, and extricated himself at the end of it. The heavy losses of the French fleet were incurred after the battle, by the seventeenth-century equivalent to flotilla work.

CHAPTER V.

AIRCRAFT CARRIERS.

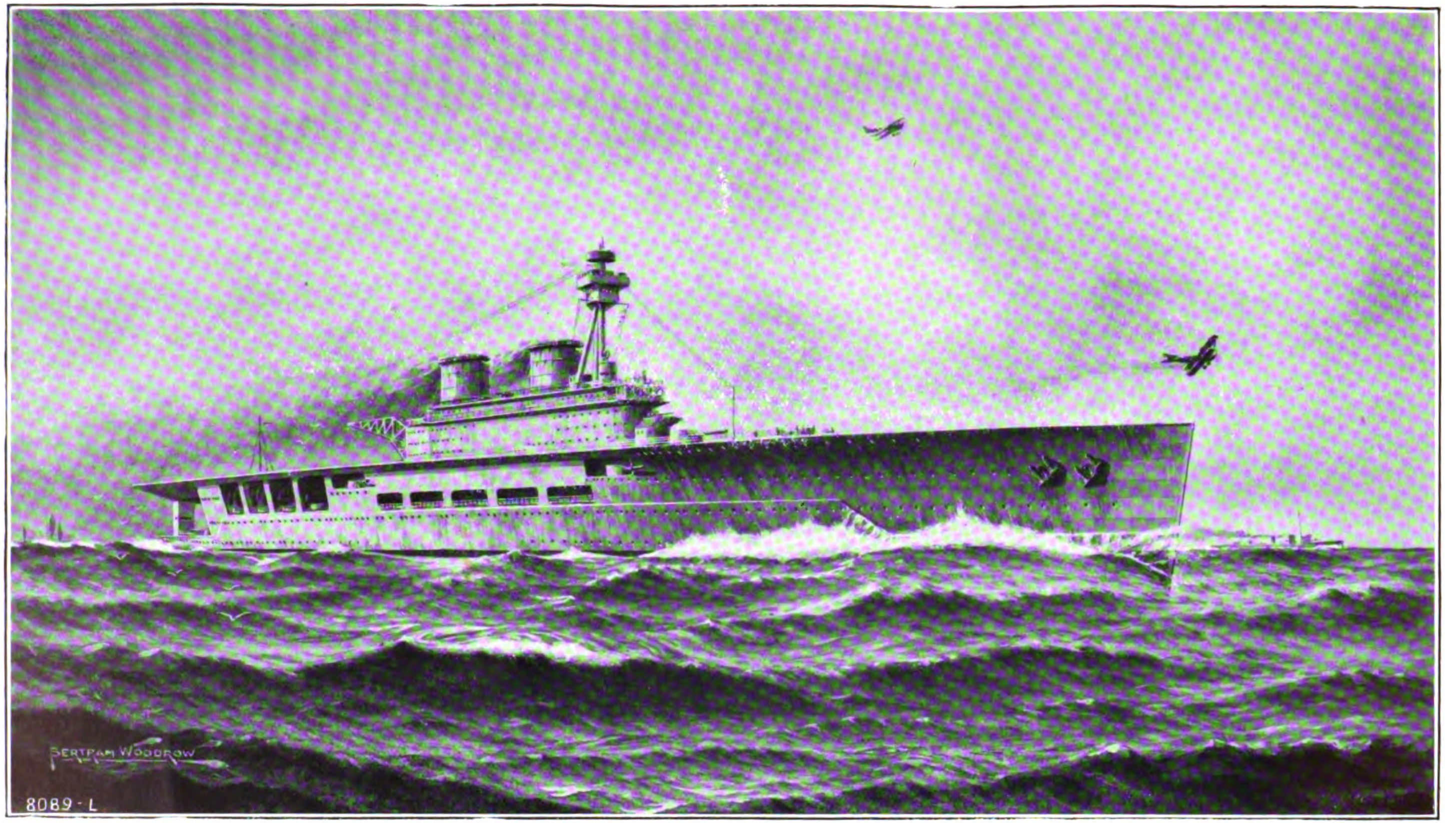
By the Washington Convention the standard displacement of vessels which may be classed as aircraft carriers is to be between 10,000 tons and 27,000 tons; the calibre of the largest gun carried is not to exceed 8 in.; and if the calibre of any gun carried exceeds 6 in. the total number of guns exceeding 5 in. calibre is not to be more than 10. Each contracting Power, however, may build not more than two aircraft carriers not exceeding 33,000 tons standard displacement each, and carrying not more than 8 guns of a calibre exceeding 5 in. if the calibre of any gun carried exceeds 6 in.

The only existing ship specially designed as an aircraft carrier appears to be H.M.S. Hermes, a vessel of 10,400 tons normal displacement and 25 knots speed. As the displacement of 10,400 tons probably refers to the condition of the ship when carrying a certain amount of oil fuel and reserve feed water, the standard displacement, without these weights, may be below 10,000 tons, in which case the Hermes is not an aircraft carrier according to the definition of the Washington Convention. The same thing is also true of several ships which have been converted for aircraft carrying, but the following British ships which have been converted from other uses to that of aircraft carrying come within the definition:—

	Normal Displacement. Tons.	Speed. Knots.
H.M.S. Argus	14,450	20¾
H.M.S. Furious	19,100	31
H.M.S. Eagle	22,790	24

Photographs of the two first-mentioned vessels are reproduced on the Plates facing pages 118 and 122, respectively, while H.M.S. Eagle is illustrated on the Plates facing pages 22 and 28. From these the differences in the arrangements of their funnels and superstructure can be seen.

The U.S.S. Langley, of which an interesting description by Lieut.-Commander H. R. Keller, U.S.N., has appeared in the *Journal of the American Society of Naval Engineers*, had a displacement of 19,230 tons on a draught of 27 ft. 6 in. when loaded as a fleet coaling ship, and though no doubt of lighter draught and displacement when carrying aircraft than when carrying coal, will certainly be heavy enough to come within the category of aircraft carriers. When employed in this service her speed will no doubt be greater than 15 knots, which was her speed on full-power trial as a loaded collier, but is not likely to be high enough to enable her to cruise



(*From a drawing by Bertram Woodrow.*)

DESIGN FOR 26,200-TON AIRCRAFT CARRIER.

(*For particulars see p.* 115.)

with the fleet. This ship appears to be intended chiefly as an experimental vessel, on which various installations in connection with landing and flying off of aeroplanes, arrangements for discharge of funnel gases, etc., can be tried. A reproduction of a photograph of this vessel, showing her general external appearance, and a longitudinal section showing the appropriation of the various compartments, appear on the Plate facing page 112.

The U.S.S. Lexington and Saratoga, which were designed as battle-cruisers of 43,500 tons displacement and 33·3 knots speed, will probably be nearly of the highest permissible standard displacement of 33,000 tons when they are converted to aircraft carriers.

Apart from the Convention definition, the lower limit of size of an aeroplane carrier would be fixed by the smallest length of clear deck on which a machine can safely land, which depends on the relation between the landing speed of the aeroplane and the speed of the ship, and also on the efficiency of any arresting devices which may be fitted on the deck.

NEED FOR LARGE VESSELS.

It has been stated that aeroplanes have landed on, and taken off from, American aircraft carriers with only 25-ft. run. However this may be, the published information about H.M.S. Furious shows that the landing deck is about 300 ft. long from its after end to the ship's funnel, and the flying-off deck from the funnel to the forward end is even shorter, from which it may be inferred that a carrier for certain types of aeroplane could be designed on a length not greatly exceeding 300 ft., and, therefore, of much less than 10,000 tons standard displacement.

A vessel considerably longer than 300 ft., while satisfying other practical requirements, could not conveniently have a hangar of sufficient internal height to allow aeroplanes to be rapidly moved from any stowing position inside the hanger to the flying deck. It would only carry a few machines, and would have insufficient speed to keep up with a fleet in any sort of weather, or to escape from more powerfully armed cruisers. The dimensions and displacement of H.M.S. Hermes are probably about the least that could be given to a vessel specially designed for carrying aeroplanes and for cruising with the fleet. Her designed speed is the same as that of the battleships of the Queen Elizabeth class.

Whatever the minimum space may be on which an aeroplane of low landing speed can alight when flown by a highly skilled pilot prepared to take considerable risk, the general safety in landing all sorts and sizes of machines as a matter of every-day routine will be promoted by providing the largest possible deck area on which to land. A large deck area implies a large ship which will roll and pitch less in a seaway than a small one, and the reduction of rolling and pitching, whatever the mere size of the landing space may be, will conduce to facility and safety in landing. The rolling of the small ship can be reduced to reasonable limits by fitting a stabilising device, but the large ship will be equally steady either without any such device or with a stabilising installation of less weight in proportion to the total displacement.

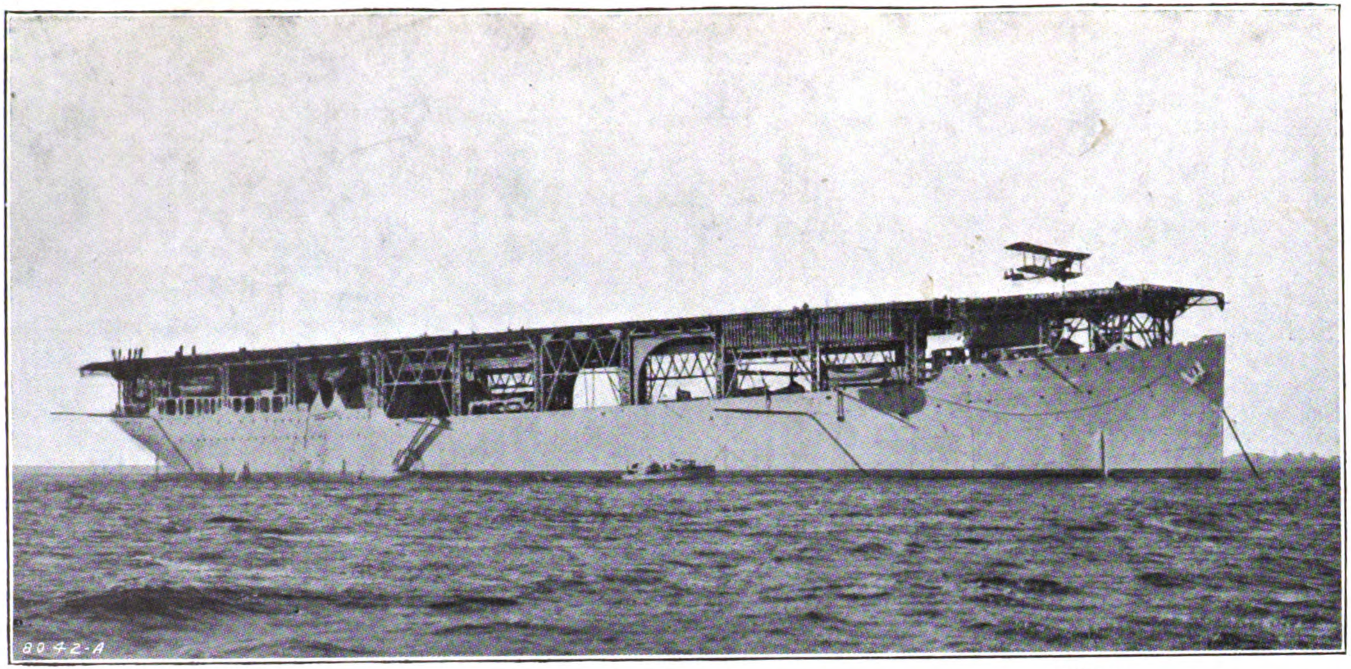
Any aircraft-carrying ship, as a rule, will have some of its machines under repair at any given moment, as the aeroplane is a delicate structure subjected to hard usage, and its engine requires a great deal of skilled attention to keep it in running condition; and the number under repair is liable to be a more serious proportion of the whole number carried the smaller the latter number is. As each ship will probably carry several different types of aeroplane suitable for different services, such as making torpedo or bombing attacks against ships, making attacks on bombing or torpedo aeroplanes, scouting, etc., a large ship is desirable in order that a sufficient number of each type of machine may be carried, to allow for this deduction from the effectives at any instant.

Need for High Speed.

In cruising with a fleet, it will frequently happen that an aeroplane carrier will have to manœuvre independently to permit aeroplanes to land on or take off from her deck. As long as the speed of the ship is less than the landing speed of the aeroplane, the most favourable condition for landing or taking off is attained when the vessel is steaming head to wind, as the relative speed of the aeroplane along the deck at the moment of landing or lifting is then reduced to the lowest possible. If the fleet is steaming with the wind astern and the aircraft carrier has to pick up many machines it will, therefore, frequently happen that she will get separated from the fleet by a long distance, and the more her speed exceeds that of the fleet the shorter time will the fleet be deprived of her services, and the less risk the aircraft carrier herself will run of being attacked when isolated.

On account of the special nature of the services which the aircraft carrier can render to the fleet, and of her general vulnerability and of the special liability to destruction of the machines on board of her in a gun action, it will be the policy of such a vessel to avoid an artillery action even with a cruiser less powerfully armed than herself, and, on account of the difficulty of disposing her gun armament to the best advantage, she may be, in effect, less powerfully armed than cruisers much smaller than herself, even if she carries the maximum gun armament allowed by the Convention.

For these reasons, substantially higher speed than that of a fast cruiser is a necessity for an aircraft carrier, and the requirement for high speed, like that for the greatest possible area and length of landing deck and for stowage of a large number of aeroplanes, demands a large and, above all, a long ship, since, as is well known, large size and particularly great length in a ship conduce to the attainment of high speed at a moderate development of propelling power and expenditure of fuel. It appears probable, therefore, that the total tonnage for aircraft carriers allowed to the Powers signing the Washington Convention is, in the long run, likely to be used up in the construction of ships approaching the upper limit of



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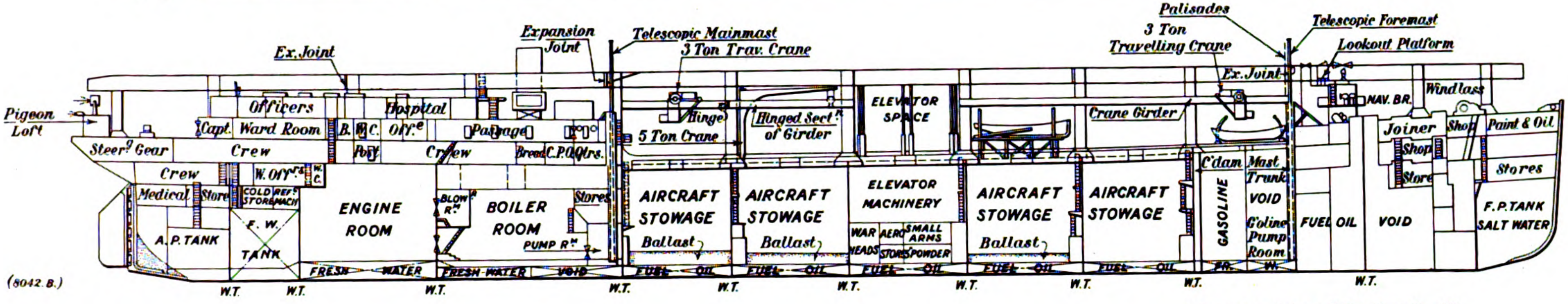

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(Reproduced from "Engineering.")

UNITED STATES AIRCRAFT CARRIER LANGLEY, (FORMERLY COLLIER JUPITER).

(For particulars see p. 110.)

displacement, and it becomes of interest to consider what would be the probable dimensions, qualities, and capabilities of vessels of a displacement approaching this limit.

DISPOSITION OF HANGAR AND LANDING DECK.

The first necessity in an aircraft carrier is, of course, the largest possible and least obstructed topmost deck on which the aircraft can land, and from which they can fly off. Such a deck may be either in the nature of a superstructure built and supported as lightly as possible and not contributing to any important extent to the strength of the hull as a whole, or it may be incorporated in the hull structure as one of the chief contributories to its longitudinal strength. The U.S. aircraft carrier Langley has a flying-on deck of the former type with an open 'tween deck space beneath it and no large aircraft hangar. Owing to its slow speed a comparatively small length of the ship is taken up by propelling machinery and boilers, so that large hold spaces exist in which aircraft can be stowed, rendering a hangar under the flying deck unnecessary. Though such a hangar would have allowed a large additional number of aeroplanes to be carried, it was probably undesirable to add an unduly heavy structure above the original upper deck of the ship on account of the effect on the stability.

In an aircraft carrier of high speed, however, the propelling machinery and boilers will occupy so great a length of the hull that there will be little or no space for stowing aircraft in the hold, and the construction of a hangar extending over the whole length of the ship is a necessity if any considerable number of aircraft is to be carried. The flying deck, which forms the roof of the hangar, then becomes one of the main structural features of the hull, and as economy of steel as well as great aeroplane stowage capacity are both promoted by this system of construction, it will, no doubt, be generally adopted in ships specially designed as aircraft carriers. The depth of the ship from the keel to the landing deck then becomes the sum of the heights of the machinery space and of the hangar with the necessary additions for structural features, and is a fundamental dimension in the design upon which the remaining dimensions of the ship depend to a very great extent. The height of the hangar in turn depends upon the size of the aircraft which are to be carried in it, and the most suitable dimensions of an aircraft-carrying ship thus depend in an intimate way on the particular types of aircraft which it is intended to carry.

STOWAGE OF AEROPLANES.

The figures given later for the numbers of machines which can be carried by ships of various dimensions are based on stowing dimensions for two types of aeroplane which are alluded to as the bomber and the fighter respectively. The bomber is assumed to have folding wings, and to stow in a space 38 ft. long by 17 ft. 6 in. broad by 15 ft. high, with a reasonable clearance all round, and the fighter, without folding wings, in a floor space of 490 square ft., with maximum horizontal dimensions of 34 ft. by 23 ft. and a height of 10 ft. 6 in. A bomber having these stowing dimensions should be capable of carrying about 2,000 lbs. weight of bombs or torpedoes and sufficient petrol to give a range of flight of 400 to 500 miles, and the fighter should be capable of carrying a machine-gun armament and sufficient petrol for a range of flight of about 300 miles. The floor of the hangar may be occupied by machines stowed as closely together as conveniently possible, and sufficient head room must be available to allow of the transfer of a machine from any position on the floor to the hatch or hatches leading to the flying-off and landing deck. The internal height of the hangar should, therefore, be more than twice the overall height of the aeroplane over the whole floor area.

If the hangar is broad enough to stow three rows of aeroplanes, its capacity can be increased with very little addition to the height by building side platforms at the half height of the hangar, leaving rather more than the breadth of an aeroplane between their inner edges. Machines can then be stowed both on and under the side platforms, leaving a clear gangway in the middle of the hangar into which any machine can be drawn from its stowing position for transport to the hatches leading to the flying deck. Transport would be effected by trolleys running on rails worked under the girders supporting the hangar roof, and the aeroplanes would be raised to the flying deck on a power-operated lift, the platform of which, about 2,000 sq. ft. area, is flush with the flying deck when the lift is in its raised position. It is useless to increase the height of the hangar beyond twice the stowing height of the aeroplane with the necessary clearance unless it is made half as high again, so as to take another platform for another layer of machines. Any increase of breadth of hangar should also be a multiple of the breadth of the aeroplane to be stowed, otherwise the number of machines carried will not increase in proportion to the increase of floor area.

CONSIDERATIONS AFFECTING PRINCIPAL DIMENSIONS.

Determining the internal height of the hangar over the machinery space by the stowage height of the bomber, and over the boiler space by that of the fighter, the depth from keel to flying deck of a large aircraft carrier such as we are contemplating cannot well be less than 68 ft. 6 in. Such a depth of hull is comparable with the depth from keel to the highest deck of large passenger liners, and is much greater than the corresponding dimension of any other type of warship. It entails a high position of the centre of gravity of the ship, which in turn implies a high ratio of beam to draught in order to obtain sufficient stability. From this consideration, and others of an equally practical nature, it follows that the depth of hull cannot be increased over 68 ft. 6 in. by so much as the stowing height of an aeroplane, which is the least increase in height of hangar and overall depth of ship necessary to allow a larger number of machines of the assumed dimensions to be carried.

It may be remarked that the problem of designing an aircraft carrier so as to get the most powerful armament on a given displacement of ship differs specifically from the similar problem in any other type of warship. In the aircraft carrier the weight of the principal armament, represented by the aircraft carried, directly affects the displacement of the ship only to an almost negligible extent. This kind of armament affects the displacement of the ship by its bulk, which renders necessary huge stowing spaces and great weight and strength of hull structure, whereas powerful gun and torpedo armaments are formidable weights large in relation to the weight of hull structure required to carry them.

It is desirable that the draught of the ship should be sufficient to keep the tops of the boilers well below the water-line when the ship is carrying a weight of fuel oil approaching half the total capacity of her bunkers, and, with boilers of the size usually fitted in high-powered warships, the draught of the aircraft carrier which we are considering may be taken as 25 ft. With a draught of 25 ft. and the vertical distribution of weights approximately determined by the depth of hull, a maximum breadth of 88 ft. at the water-line will be required to give adequate stability.

The section will be of the "bulge" type with a maximum beam of 98 ft. below water in order to provide protection against the effects of underwater explosions. With the type and dimensions of the transverse section of the ship, including the width of the hangar, thus fixed, the number of aeroplanes which can be carried and the displacement are both proportional to the length of the ship, which must be that which gives the greatest displacement allowed by the Convention, taking into consideration the fineness of underwater form appropriate to the high speed required. If any smaller length were adopted so as to build more relatively short ships on the same aggregate displacement as that of a number of the longest possible ships, only the same number of aeroplanes at best would be carried at a lower speed. Owing to the great depth of hull there is no difficulty from structural considerations in going to the maximum length of ship allowable under the Convention.

Dimensions for 26,200-ton Aircraft Carrier.

With these considerations in mind, the following approximate dimensions are suggested as suitable for a large aircraft carrier, the general appearance of which is shown on the Plate facing page 110.

Length on normal water-line	900 ft.
Beam at normal water-line	88 ,,
Maximum beam underwater	98 ,,
Maximum breadth of flying deck	112 ,,
Normal draft, when carrying about 2,800 tons of fuel and reserve feed water	25 ,,
Displacement at 25 ft. draft	29,000 tons.
Standard displacement	26,200 ,,

Such a ship could carry a quadruple-screw machinery installation of the same power as that of H.M.S. Hood, which would give her a speed of 34½ knots. She would have 3-inch side protection extending from 4 ft. below the water line to about 23 ft. above for a length of about 600 ft., reduced to a height of about 10 ft. above the water line at the ends, and would be protected by "bulges" against mines and torpedoes. It is not worth while to use a greater thickness of armour, as the ship is not intended to engage ships carrying heavy guns, and, in any case, it would be impracticable to armour the hangar sides; but the top of the hangar would be 2 in. thick for protection against aircraft bombs.

ARMAMENT.

She could conveniently carry an armament of eight 8-in. guns and four anti-aircraft guns, together with the ordinary allowance of three-pounders for saluting, machine guns, etc. It would be possible to carry the maximum armament of ten 8-in. guns allowed under the Convention at the expense of a small reduction in hangar area and some complications in the magazine arrangements. It is believed, however, that in this type of ship the gun armament should be regarded as a means of defence in emergency, and not as the *raison d'être* of the ship, and that it should be subordinated to the aircraft requirements.

She would not carry torpedo tubes, as the reasons which render it undesirable for an aircraft carrier to take the offensive in an artillery action apply even more strongly to any attempt to close with an enemy sufficiently to enable torpedo tubes to be used. She would have a hangar of about 28,000 sq. ft. in floor area, which would accommodate 23 bombers and 28 fighters, of which all the bombers and 14 of the fighters would be immediately transportable from the hangar to the flying deck, when stowing the full number of machines, without moving any other machine than the one which was to be sent up. Workshops of ample size for repairs to aeroplanes and their engines, for doping wing fabric and for all necessary work in connection with the maintenance of aircraft would be provided. The flying deck would have a length of 920 ft., and a maximum breadth of 112 ft., with a clear area for landing and taking off of about 2 acres. Provision is made for carrying about 200 tons of bombs and torpedoes for use on the aeroplanes, in addition to machine-gun armament and the necessary supplies of petrol, lubricating oil, spare gear, stores, etc.; it would, however, be easy to arrange for a greater weight if required. The total fuel-oil capacity would be sufficient to give the ship an endurance of 2,300 sea miles at full speed, and about 10,000 sea miles at 16 knots.

ARRANGEMENT OF SUPERSTRUCTURE.

The funnels and mast are brought to one side of the ship, and a position for navigating and fighting the ship is provided by a superstructure surrounding and extending forward and aft of the funnels and mast. This superstructure would be about 250 ft. long, and would reduce the clear deck space abreast of it to a width of about 86 ft. Any erection on the landing deck is objectionable, on account of the restriction it places on the aeroplane pilot's freedom of manœuvring when landing and of the eddies and cross currents in the air which it produces, not only to leeward but to a less extent to windward and in other directions, thus increasing the difficulty and danger of landing on the deck; but the necessity of providing a good position from which the ship can be navigated and fought conflicts with the requirement for clear and unencumbered landing deck space, and will inevitably lead to compromises, to which serious objections can be raised. A mast with fire control and director tops must be fitted somewhere, and a position amidships, as near to the side as possible, is that which allows the ship to be most easily handled, so as to give the aeroplane the best conditions for landing.

Disposition of Funnels and Bridge.

Having accepted the necessity for the mast, the landing conditions are not made substantially worse by erecting the funnels in the same fore-and-aft line as the mast, and building a long narrow superstructure round both funnels and mast, thereby providing a good position for navigating and fighting the ship, and for anti-aircraft guns. The hot gases from the funnels will pass off to leeward in the same general direction as the eddies produced by the whole superstructure, and the manœuvring of the ship which allows a machine to land clear of the eddies, will also enable it to clear the funnel gases. The 8-in. gun placed on the flying deck forward of this superstructure has a more effective position for fighting purposes than any other in the ship, and forming, from the aerodynamical point of view, merely an extension of the superstructure, will not render the landing conditions materially worse.

The photographs of H.M.S. Hermes reproduced on the Plates facing pages 4 and 10, and that of H.M.S. Eagle on the Plates facing pages 22 and 28, show that the system of placing the bridge superstructure on one side of the ship, and incorporating in it the funnels and the mast, is that which has been adopted in these vessels, and it is understood that a somewhat similar arrangement is to be adopted in the converted United States battle-cruisers Lexington and Saratoga. Other arrangements are possible, but, on the whole, seem to have less to recommend them than that in which the funnels and mast are placed on one side of the ship. For instance, the funnels can be dispensed with, and the gases can be led through ducts to the after end of the ship and discharged, after cooling to reduce their volume, through openings in the ship's side. There is then no liability of the fighting tops being rendered uninhabitable by the funnel gases as there is in any ship, whether an aircraft carrier or not, with mast and funnels fitted in their usual relative position. On the other hand, an aeroplane coming in over the stern of an aircraft carrier at a small angle of descent is more likely to be caught in the funnel gases when they are discharged at the stern of the ship, just below the landing deck, than when they are discharged through funnels near amidships at a good height above the deck.

It is also possible to dispense with the navigating bridge as a superstructure above the flying deck, by stopping this deck short of the bow of the ship, and arranging the navigating position under its forward end. This is somewhat unsatisfactory, as an all-round view can hardly be obtained from a navigating bridge so situated, which is a considerable disadvantage, particularly when handling the ship for the convenience of aeroplanes landing over the stern.

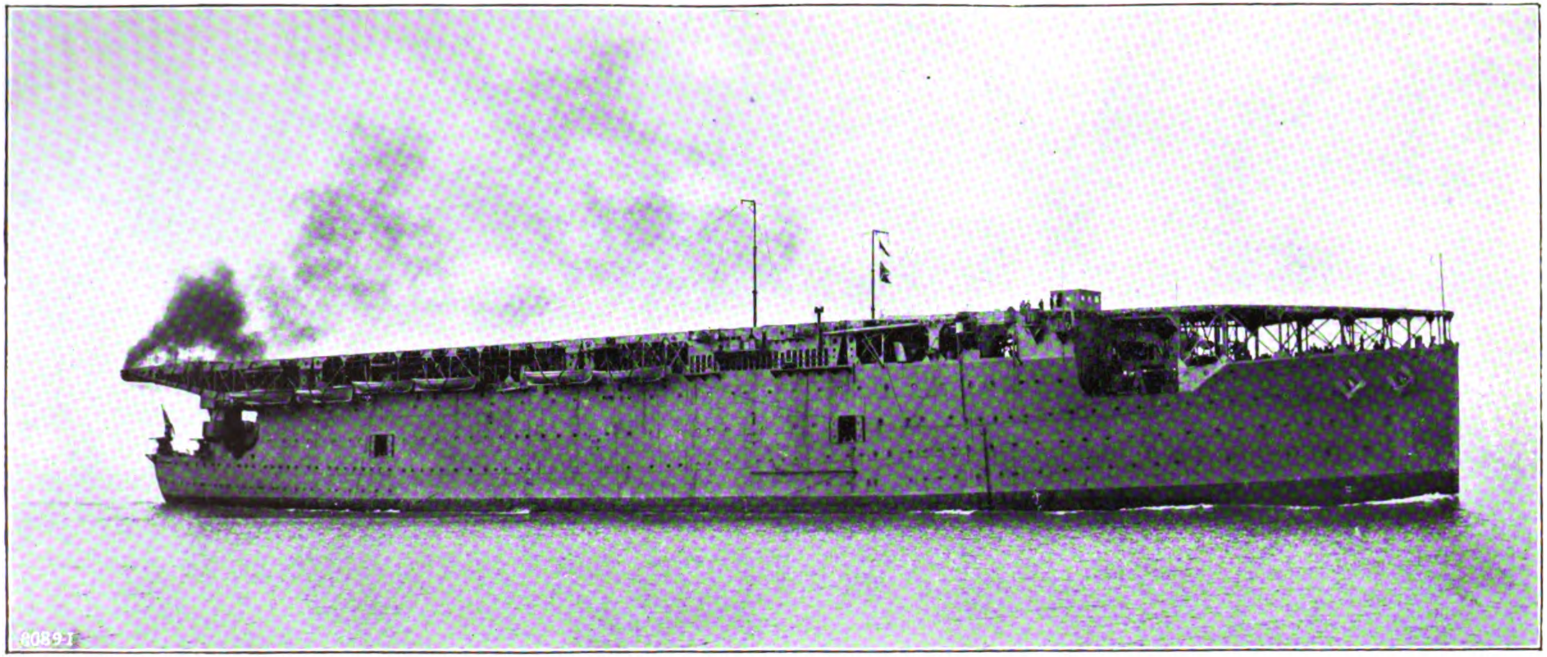
PROVISION OF A MAST.

With the funnels and navigating bridge thus disposed of, the only remaining obstruction above the flying deck is the mast. In a ship without an important gun armament, the mast can be light and dismountable, so that machines landing on or taking off from the deck, can have the greatest possible freedom for manœuvring.

This arrangement has been adopted in H.M.S. Argus, a merchant vessel 565 feet long converted into an aircraft carrier during the war, the general appearance of which, and in particular the position of discharge of the funnel gases, is shown in the reproduction from the photograph on the Plate facing this page. A similar arrangement was proposed by Sir Eustace d'Eyncourt, Director of Naval Construction at the Admiralty, and Mr. J. H. Narbeth in a paper read before the Institution of Naval Architects in March, 1923, in which the project of a passenger liner adapted to carry aeroplanes for commercial purposes was put forward.

The description of the U.S.S. Langley, to which reference has been already made, shows that the flush deck without any bridge superstructure has also been adopted in this vessel. The funnel gases, however, are not led aft, but are discharged in the natural longitudinal position immediately above the boiler room at about 150 ft. forward of the after end of the flying deck. On the port side of the ship there is a short funnel, extending 8 ft. above the flying deck, which can be rotated about a point below the level of the deck so as to leave the deck clear when an aeroplane is landing, and on the starboard side the discharge aperture is apparently flush with the ship's side. Cooling sprays are fitted on the starboard side, and a system of dampers is fitted to enable the gases to be discharged at either side of the ship at will. The difference between the two sides has been adopted presumably for experimental purposes.

None of these vessels has a powerful gun armament necessitating a tripod mast with fighting tops, which is the feature rendering the superstructure at one side of the ship the least of various evils, but it would appear that the Langley's funnel arrangement with the dampers which ensure the discharge of the funnel gases to leeward would be as suitable for a ship with a mast and fighting tops as for one without. The rotatable funnel on the port side of the Langley appears to be in an exposed position, and to be a somewhat less desirable device than the plain opening in the starboard side.



(*Photo: Stephen Cribb, Southsea.*)

H.M. AIRCRAFT CARRIER ARGUS.

(*Constructed by Messrs. William Beardmore & Co., Ltd., Dalmuir.*)
(*For particulars see p. 425.*)

Dividing the Superstructure.

There would be some advantages in fitting a narrow superstructure with funnel and mast on each side of the ship, leaving about the same clear breadth of deck as with the superstructure on one side only. This arrangement would allow of a better lead of boiler uptakes, and of a slight reduction in the depth, and, therefore, of the weight and cost of the hull. It would also remove the necessity, which exists when the superstructure is on one side only, for making special trimming tank arrangements so that the ship can be kept upright in all conditions of loading. There is, however, little difficulty in meeting this requirement and the advantages of the symmetrical arrangement of superstructures are entirely outweighed by the disadvantage of the restrictions which a superstructure on both sides of the ship would place upon the freedom of manœuvring of a machine landing on the deck and the unavoidable eddies which would be produced in the air above the deck. It is possible to arrange a navigating bridge upon lifting and lowering mechanism which would raise it above the landing deck normally, and lower it flush with the deck when a machine is about to land. This arrangement, however, is obviously inefficient, as it puts the bridge out of action just when it is most necessary for the officer handling the ship to obtain an all-round view.

Advantages of Internal-combustion Engines.

The difficulty in the disposal of the funnel gases would be very much diminished if the aircraft carrier could be propelled by internal-combustion engines instead of steam engines, thereby reducing the weight of fuel oil consumed for equal power developed by more than 60 per cent., and the weight and volume of the products of combustion discharged in a still higher proportion. This improvement, like others, such as the greatly extended radius of action, which depend on the use of internal-combustion engines, will only become a matter for practical consideration when this type of engine has been constructed in units giving far higher power from each cylinder than is practicable at present.

Larger Aircraft Carriers.

The qualities which can be obtained from a specially designed aircraft carrier of 27,000 tons standard displacement appear to meet present-day requirements so fully as to leave little inducement to incur the expense of building two larger vessels having a standard displacement each of 33,000 tons, as permitted by the Convention, especially when the limitation of total aircraft-carrying tonnage allowed to each Power is taken into account. If, however, these larger vessels were built, it is considered that the additional displacement would be better used in obtaining still higher speed and greater aircraft-carrying capacity than for any other purpose such as increasing the armour protection.

DESIGN FOR MAXIMUM SPEED.

With the object of obtaining the highest possible speed, the length of the ship of 26,200 tons standard displacement, already described, would merely be increased to the practical limit imposed by the dimensions of existing building slips and docks, which is considered to be about 1,000 feet on the water line. A small increase in height and breadth of the hangar might be given which, though of no use for stowing a greater number of aeroplanes of the sizes adopted for purposes of illustration and comparison, would improve the facility of handling and allow slightly larger machines to be stowed if required. In increasing the beam to take the larger hangar the width of the "bulge" would also be increased to improve its value as a protection against underwater explosion. This process would lead to a vessel having approximately the following dimensions and qualities:—

Length on water-line	1,000 ft.
Beam at water-line	89 „
Maximum beam under water	100 „
Draught, with 2,500 tons of fuel oil and reserve feed-water on board	25 „
Displacement at 25 ft. draught	33,000 tons
Standard displacement	30,500 „

This vessel would have quadruple-screw propelling machinery of 180,000 shaft horse-power, giving her a maximum speed of 36·3 knots at a displacement of 33,000 tons. Her flying deck would have a clear landing and flying off area of 2¼ acres, and she would carry 27 bombing or torpedo-carrying aeroplanes, and 34 fighters, of which any one of the bombers and 17 of the fighters could be moved from the hangar to the flying deck without disturbing any of the other planes stowed in the hangar. She would have the same armament, and armour protection of the same thickness covering an equivalent area, as the ship of 26,200 tons standard displacement, and would be designed with the funnels and mast on one side. The deck over the hangar would be 2½ inches thick for protection against aircraft bombs. In a moderate seaway she would steam faster than the fastest destroyers, and would have some value as a destroyer of destroyers apart from her aircraft-carrying value.

The displacement of this ship falls 2,500 tons short of the 33,000 tons standard displacement allowed by the Convention, and the maximum speed of 36·3 knots is probably more than practical requirements dictate. It is greater than the landing speed through the air of most aeroplanes, so that the ship, especially if steaming head to wind, would have to run very much slower to permit machines to land or to take off. A part of this available displacement could be used to increase the weight and power of the machiney, still leaving a reasonable amount of fuel on board at 33,000 tons displacement. In this way the maximum speed of this vessel at 33,000 tons displacement could be increased to more than 37 knots, but only at the cost of putting an unprecedented power on a single shaft if the four-screw arrangement were adhered to, or alternatively of increasing the number of propellers, which is not an attractive proposition.

DESIGN FOR MAXIMUM STORAGE CAPACITY.

To attain the other desideratum of the large aircraft carrier, namely the greatest possible aeroplane stowage capacity, the breadth of the hangar incorporated in the structure of the 26,200-ton ship must be increased by the stowage breadth of an aeroplane as previously explained, with a corresponding increase in the beam of the ship. The approximate dimensions of the ship would then be as follow:—

Length on water-line	975 ft.
Maximum breadth on water-line	100 „
Maximum breadth below water	112 „
Draught, with 3600 tons of oil fuel and reserve feed-water on board	25 „
Displacement at 25 ft. draught	36,000 tons
Standard displacement	32,400 „

She would carry propelling machinery of the same power as the 1,000-ft. ship, and would have a maximum speed of 35¾ knots at a displacement of 36,000 tons. Her flying deck would have a clear landing and taking-off area of 2⅜ acres, and she would carry 35 bombing or torpedo-carrying aeroplanes and 37 fighters, of which 20 bombers and 19 fighters could each be moved individually from their stowing position in the hangar to the flying deck without touching any other plane stowed in the hangar. The gun armament would be the same as for the 1,000-ft. ship, and the armour protection of the same thickness would cover corresponding areas. On account of her great breadth, this ship would have an unusually large metacentric height, and might require an anti-rolling device either in the form of tanks on the Frahm system or of a gyro stabiliser to lengthen the period and reduce the amplitude of rolling in certain states of the sea ; but the ship is so large that any such device is hardly likely to be necessary to meet practical aeroplane landing conditions in ordinary rough weather.

AMERICAN AIRCRAFT CARRIERS.

The provision of the Convention allowing each Power to have two 33,000-ton aircraft carriers was apparently adopted to permit conversions of other types of ship into aircraft carriers rather than to allow new tonnage to be designed and built of this displacement. The United States ships Lexington and Saratoga will have a speed of over 35 knots at a displacement of 33,000 tons on a length of 850 ft. with the machinery of 180,000 shaft horse-power for which they were designed. Their aircraft-carrying capacity, landing and flying off facilities will probably be inferior to those of the specially-designed 33,000-ton ship suggested above, owing to their shorter length, but they may be more heavily armoured, and appear likely to be the most powerful and useful aircraft carriers afloat for some years to come.

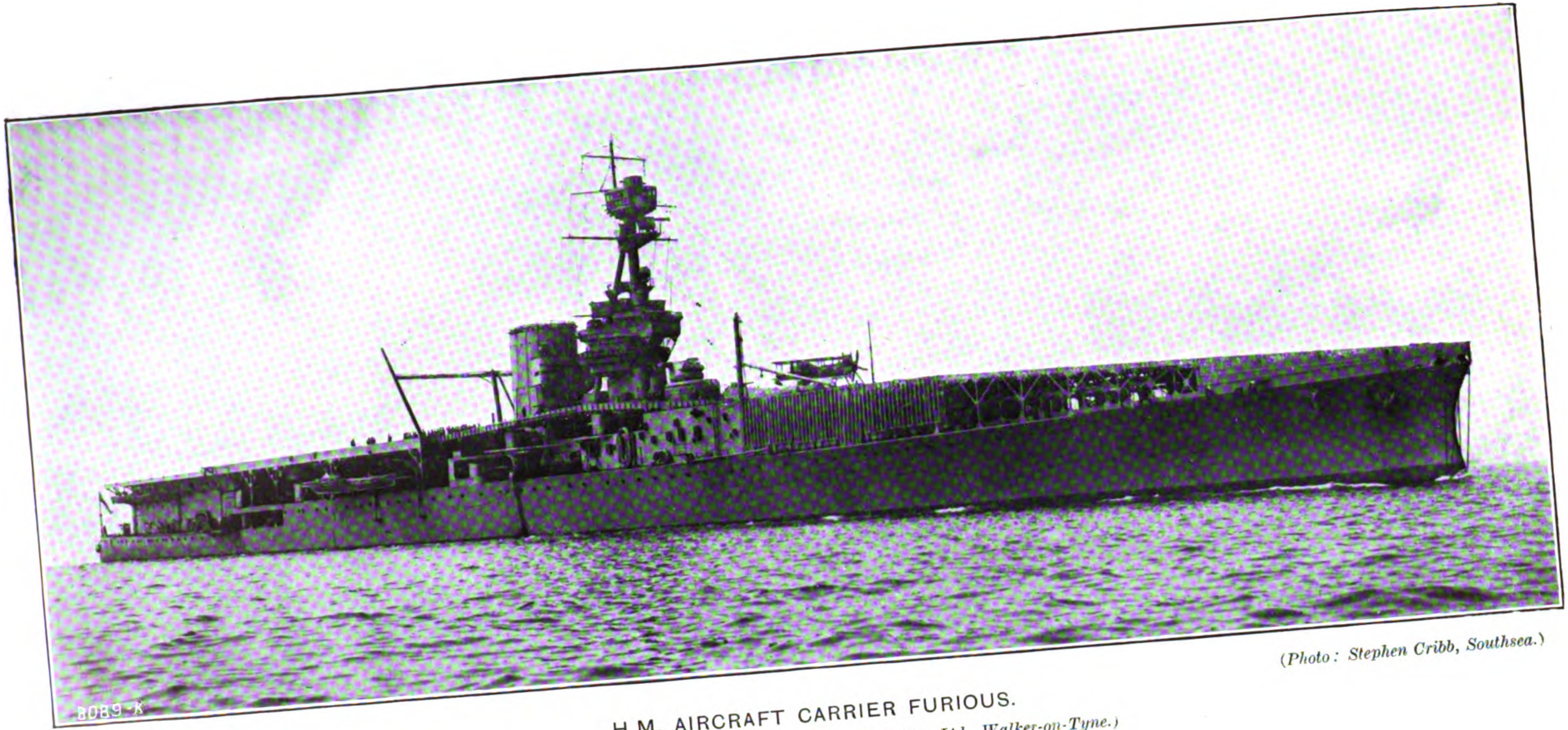
Aircraft-carrying ships such as those described above, are equal in displacement to many heavily armed and armoured battleships and battle-cruisers. Inasmuch as some authorities hold that vessels of the latter types are of little use on account of the destructive power of modern aircraft and submarines, the possibility of building aircraft carriers which would rank as capital ships, appears worth considering.

AIRCRAFT CARRIERS RANKING AS CAPITAL SHIPS.

At first glance this would seem to be forbidden by the terms of the Washington Convention, seeing that part of the agreed definition of a capital ship is that she is "not an aircraft carrier." On turning to the definition of an aircraft carrier it appears that, however predominant the aircraft-carrying idea may be in the design of a warship, if she has even one gun of more than 8 in. calibre she is "not an aircraft carrier," and may, therefore, be built to replace capital ship tonnage as it becomes due for replacement. A vessel designed for the "specific and exclusive" purpose of carrying aircraft within the meaning apparently attached to those terms in the Convention definition, may thus be built of maximum standard displacement of 35,000 tons allowed for a capital ship, or about 2,600 tons more than that of the vessel which has been described above as of 36,000 tons, when carrying 3,600 tons of fuel oil and reserve feed water. The additional 2,600 tons displacement would be best used in increasing the length of the 36,000-ton ship from 975 ft. to 1,040 ft., keeping the other dimensions constant. The ship so increased in length would have a speed of 36 knots with propelling machinery of 180,000 shaft horse-power, and would carry one or two guns of say 9·2 in. calibre to lift her out of the category of aircraft carriers under the Convention definition. As regards the remainder of the gun armament and the extent and thickness of side and deck protection she would be similar to the 36,000-ton ship, and would have hangar accommodation for 14 bombing or torpedo-carrying aeroplanes and 40 fighters.

UTILISATION OF STORAGE SPACE.

The numbers of bombing and fighting machines which each ship is stated to be able to carry represent the condition of the hangars when the most economical use is made of the space with due regard to accessibility and facility of handling. In all cases an 8-in. gun comes at each side of the ship somewhere near the middle of the total hangar space, and somewhat restricts its breadth locally; and the forward part, which being over the boilers and uptakes is somewhat less lofty than the after part, is given up to the fighting machines, which have the smaller vertical stowing dimensions, while the after part is given up to the bombers. It is not intended to imply, by stating these numbers, that they represent the proportions in which the two types of machines should be carried or that the types named are the only ones which should be carried. The hangars are large compartments which can stow any size of aeroplane, though types



(Photo: Stephen Cribb, Southsea.)

H.M. AIRCRAFT CARRIER FURIOUS.

(Constructed by Messrs. Armstrong, Whitworth & Co., Ltd., Walker-on-Tyne.)
(For particulars see p. 425.)

other than those for which the spaces were designed would probably stow less economically.

A much larger number of planes with detachable wings could, of course, be carried if the delay caused by assembling the planes when required for flight could be accepted. In the description of the U.S.S. Langley, previously referred to, it is estimated that 50 aeroplanes with their wings detached will be stowed in her holds, which are of only about one-third the floor area and cubic capacity of the hangar on the ship of 26,200 tons standard displacement in which it is estimated that 23 bombers and 28 fighters ready for flight can be carried.

The question of the types of machines and the proportion of each type to be carried is one entirely for Naval and Air Force officers, and would no doubt depend on the service for which the ship was to be used. Probably the proportion would be very different in an aircraft carrier used as an auxiliary to a fleet of capital ships from the proportion which would be suitable for an aircraft carrier forming one of the main units of a homogeneous fleet of such ships, which would presumably replace the heavy-gun ships if the superiority of the aeroplane as a weapon over the heavy gun were ever established.

FIGHTING QUALITIES OF AIRCRAFT CARRIERS AND CAPITAL SHIPS.

The standard displacement of certain modern capital ships is not very different from 26,200 tons and it may be of interest to compare their cost and fighting qualities with those of the 26,200-ton aircraft carrier on the basis of this common displacement. For example, the Queen Elizabeth class could be reduced to this standard displacement by merely reducing the armour protection by 10 to 20 per cent. in thickness and weight, leaving the dimensions and armament the same and the speed substantially the same as at present. In the capital ship of this modified Queen Elizabeth class, the weight of armament and armour would exceed the corresponding weights in the aircraft carrier by approximately 9,000 tons, which, in the latter vessel, would be absorbed principally in hull and equipment, and, to a smaller extent, in propelling machinery.

As the cost per ton of gun armament and armour is so much greater than that of hull structure and fittings, there can be no doubt that the fully equipped capital ship would be far more costly than the aircraft carrier. The aircraft included in the equipment of the latter, although much more costly per ton weight than any other item of either ship's equipment, are so light in weight that they make little difference to the comparative cost of the two fully equipped ships. Probably three of the aircraft carriers could be built and equipped with aeroplane and gun armament for about the same cost as two of the capital ships. As the total tonnage of both types is limited by the Washington Convention, this means that the first cost of a fleet of aircraft carriers would be about two-thirds of that of a fleet of the same number of battleships; not that the fleet, if composed entirely of aircraft carriers, could have one and a half times as many units for the same cost as it could have if formed entirely of battleships. With the common displacement of 29,000 tons, the maximum speed of the aircraft carrier is about 9½ knots greater than that of the capital ship, and her radius of action, at any moderate speed near 16 knots, is about 15 to 20 per cent. greater.

Striking Power of Aeroplanes and Guns.

The main gun armament of the aircraft carrier is not much more than equal to the secondary armament of the capital ship, and the relative efficiency of the two ships as instruments of sea-power depends on the comparative striking-power of about 50 aeroplanes, and of 8 well-protected 15-in. guns. Each aeroplane can discharge a torpedo, or a bomb of about the same weight as a 15-in. shell, but with many times the weight of high explosive, about once in two hours at a range of 100 miles from the ship, or at a correspondingly slower rate for longer range up to a maximum of about 250 miles, while each 15-in. gun can discharge a projectile containing about 260 lbs. of explosive about twice a minute with a maximum practical range of about 12 miles. If the comparison is made with a capital ship of the Renown type, the standard displacement of which appears to be about 25,500 tons, the aircraft carrier would have rather more than 2½ knots advantage in speed, and her main armament of about 50 aeroplanes would compare with six instead of eight 15-in. guns, while her gun armament is perhaps not so negligible as it is in comparison with the more heavily armoured and more powerfully armed Queen Elizabeth type.

The strong points of the aeroplane as compared with the gun are evidently its great range and the high power of its projectiles. Its fundamental weaknesses are its inability, as an individual unit, to keep up a sustained attack, owing to its small weight-carrying power and its comparatively restricted capability of combining with other aeroplanes in an attack sufficiently concentrated and simultaneous to render nugatory the means of defence against bombing aeroplanes, which exist in the shape of anti-aircraft guns and lightly-loaded, quick-climbing fighting aeroplanes. Only experts in the use of the two weapons are qualified to judge of their relative fighting value, but such information as has been published in this country and elsewhere regarding the results of bombing experiments with aircraft, do not support the opinion that any number of aeroplanes of any kind yet constructed could prevent a fleet of capital ships from going to and retaining command of any part of the high seas where there was not a stronger fleet of similar ships to oppose them.

The numerous aeroplanes carried by a fleet of aircraft carriers could, no doubt, do some damage and give a great deal of annoyance to a fleet of capital ships, and the aircraft carriers themselves could keep out of range of the big guns of the capital ships. It is difficult to believe, however, that command of the sea could be kept by systematic evasion of the enemy, and it seems unlikely that any of the capital ship tonnage allotted to the different Naval Powers by the Washington Convention will be used for the construction of aircraft carriers. Their function will be not to form the main strength of a fleet but to act as fleet auxiliaries, and their aeroplanes will probably be more useful for scouting than for purposes of attack on capital ships.

CAPITAL SHIPS AS AIRCRAFT CARRIERS.

The foregoing remarks apply to aircraft carriers such as those which have been described, in which the gun armament is entirely subordinated to the aircraft-carrying arrangements. A compromise between the aircraft-carrying ship and the big-gun capital ship is, however, possible in which the gun armament is given much greater relative importance. Sir George Thurston, in a chapter in last year's "Annual," described an experimental fully-armoured battleship of 30 knots speed, in which a main armament of three 16-in. guns is carried at the fore end of the ship, while the after part is devoted to an aircraft hangar with a landing and flying-off deck, a secondary armament of 8-in. or 7½-in. guns being carried abreast of the hangar.

A vessel of this sort would undoubtedly be extremely useful as a solitary unit detached from the fleet for any independent service not likely to bring her into contact with more powerfully gunned hostile capital ships; as a unit of the fleet intended to lie in the line of battle against other capital ships, equally well armoured and carrying, perhaps, three times the number of 16-in. guns, she would be at a great disadvantage. The aircraft hangar very much increases the size of the target, and would certainly be smashed to pieces if exposed to gun attack, with a considerable chance that its ruins would interfere with the working of the guns and leave the experimental ship, or a squadron of such ships, at the mercy of the better armed capital ships unencumbered with aircraft-carrying arrangements. If there were good ground for supposing that preliminary long-distance attack by the aeroplanes of the experimental battleships would have reduced the number of guns which the ordinary battleships could bring into action, it seems to follow that it would have been better if the experimental battleships had been "exclusive" aircraft carriers, without heavy protection, carrying many times the number of aeroplanes, and fast enough to avoid a gun action altogether.

Evolution towards perfection in fleet organisation tends to the development of special types of ships for special functions rather than to the confusion of diverse functions in individual ships, and it is probable, pending the settlement of the question of the real value of the bombing or torpedo-carrying aeroplane as a weapon of attack on ships, that a combination of aircraft carriers of the "specific and exclusive" type contemplated by the Convention with equally "specific and exclusive" heavy-gun ships would form a more powerful fleet than an equivalent number of aircraft-carrying battleships.

If the probability of a hit by a bomb dropped from an aeroplane 10,000 feet up ever becomes as great as the probability of one hit in several rounds from a big gun at a decisive range, then a real struggle for the survival of the fittest will arise between the aircraft carrier and the heavily armoured big-gun capital ship, but at present there is no incompatibility in the co-existence of both types.

H. G. WILLIAMS.

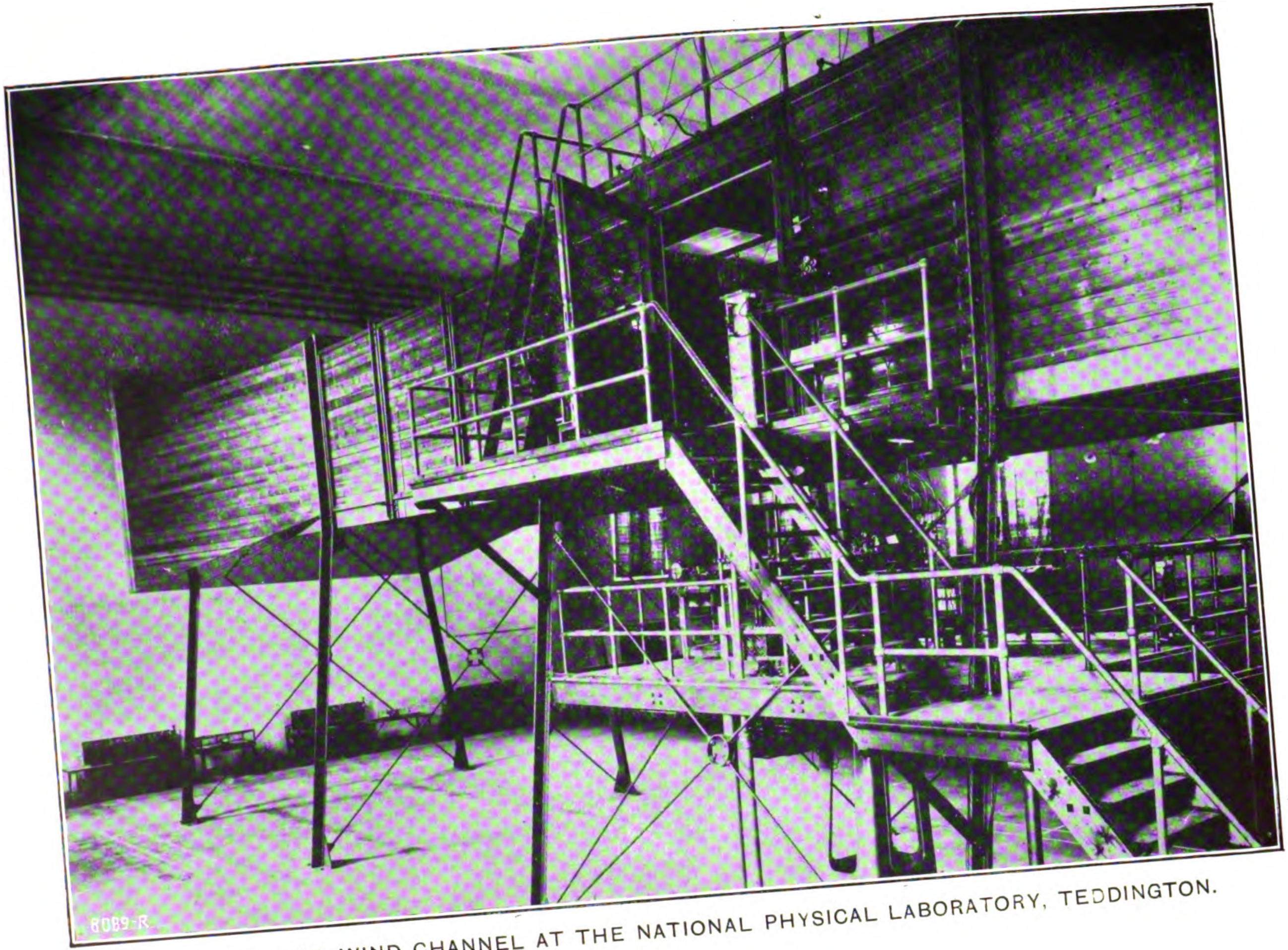
CHAPTER VI.

THE TREND OF RESEARCH AND DESIGN IN AIRCRAFT ENGINEERING.

THE consideration of this subject may best be approached by taking the position of aircraft engineering at the end of the war and comparing this with the corresponding positions in 1914 and at the present time. During the war, production was the predominant feature, and research, although carried out to a considerable extent, had to be subservient to production requirements. Endeavours were made to produce aircraft to fulfil the immediate needs of the situation and, whenever a particular need was realised, concentrated activity soon gave final form to a suitable aircraft design. The successful issue of this work depended largely upon the use of suitable materials, and meticulous care was taken during the period of hostilities in the selection of materials for aircraft construction. Certain difficulties soon became evident as the demand for materials began to exceed the supply; the supplies in many cases being handicapped by the fact that aircraft construction alone called for the use of large quantities of special materials not normally stocked in bulk. These difficulties became very real in other countries, and the shortage of suitable material had to be overcome by the use of substitutes, as an example of which reference may be made to the use of wood instead of rubber for tyres of aircraft undercarriages in Germany.

RESEARCH AND PRODUCTION.

Another factor in the development of research during the war was the reactive effect of bulk production. In this sense, research assisted production by modifying the methods used and the articles to be produced. Research facilities were not devoted entirely to new discoveries, and the improvement of current designs received more attention than the exploration of possible future designs. Production has now been reduced to a general basis and usually consists of supplying, in the first instance, three aeroplanes of a new type which, if successful, may be followed by the construction of a larger number. The genesis of production occurs when a design has been made in model form and tested in the laboratory in conjunction with calculations made from the drawings. The behaviour of the type in this condition is then taken as a criterion for further production. It can thus be realised that the small production of a new type at first required involves many difficulties and, owing to the uncertainty of increased production being demanded, jigs and other appliances are not generally made in the early stages. While passing through the



14 FT. BY 7 FT. WIND CHANNEL AT THE NATIONAL PHYSICAL LABORATORY, TEDDINGTON.

experimental stage, a new type is often subjected to many modifications rendered necessary mainly by difficulties which could not have been foreseen in the earlier stages. This procedure is the same whether the aeroplane is intended for service or civil use.

Owing to the time which must necessarily be spent on the experimental work and the rapid progress made by aircraft design, it is possible for a new type to become obsolete, in the general sense, by the time the experimental work is completed, but any knowledge gained from the experiments is not lost, since it may be embodied in future designs.

INTERCHANGEABILITY AND STANDARDISATION.

In scheming out a new type of aircraft great importance is attached to interchangeability, both as regards the components of the structure itself and to allow alternative types of engines to be fitted if desired. Components which are common to all designs of aircraft have now been standardised and this assists the provision of smaller components such as bolts, nuts, and streamline wires, which now have been scheduled in lists used in the aircraft industry.

The materials used have been investigated to meet the special requirements of aircraft construction; in particular, steel has been made and subjected to special treatment. Identification of various steels has been arranged by the adoption of a colouring scheme so that each particular brand may be recognised easily in store and used for the correct components. There is still, in a few cases, a lack of knowledge of the behaviour of steel, and the aircraft constructor should act in close co-operation with the steel maker to obtain the most suitable material.

ADAPTATION OF WAR MACHINES.

At the end of the late war the aeroplanes in use were as follows:—

Bristol fighter	Two-seater fighter.
D.H 9.A.	Two-seater fighter, or short-distance bomber.
D.H.10.	Three-seater twin-engined long-distance bomber.
F.2.A. and F.5 seaplanes	Four-seater boat seaplanes for reconnaissance.
Handley-Page O.400	Four-seater long-distance night bomber.
R.E.8.	Two-seater artillery machine for co-operation and reconnaissance.
Sopwith Camel	Single-seater fighter and ship plane.
Sopwith Snipe and S.E.5.A.	Single-seater fighters.
Vickers' Vimy	Three-seater long-distance night bomber.

A large number of the above aeroplanes were then found to be on hand as surplus stock, and the question arose as to their disposal; it had to be decided whether it was preferable to sell the aeroplanes abroad or to adapt them for civil purposes in this country. The first proposition did not meet with success as there was no market for such stocks at the time, so that efforts were made to use the aeroplanes as a basis for a civil fleet. For this purpose, all armament and war equipment had to be removed and in its stead increased passenger accommodation had to be arranged for and items such as wireless apparatus, etc., added.

The progress of civil aviation at this time was much curtailed by the lack of money, so that new types of aeroplanes could only be developed with great discretion. The chief differences between the surplus war stock and the most desirable types of aeroplanes for civil purposes, from a structural point of view, were in the endurance qualities of the aircraft. This may be exemplified by stating the case of an engine which for war purposes needed great reliability for a comparatively short period, while for civil use the engine was not required to run so near its performance limit, but its reliability had to extend over a much greater period. The opportunity for obtaining the requisite reliability, however, was increased under civil conditions as the limits of weights and stresses in the structures were not so severe, thus enabling a more ample design to be adopted with greater freedom as to the operating conditions. For civil work it has been proved that running costs are the biggest item in the total expenditure. They are also the most susceptible to increase or decrease; hence the necessity for increased reliability.

In the early days of civil aviation the only available pilots or administrative staff were those who had been trained and worked under war conditions, and the transition from these conditions to peace time requirements was naturally felt in the operation and maintenance of civil aeroplanes. The staff had been trained under conditions where man power was plentiful and where running costs were not of primary importance, both conditions being inconsistent with the satisfactory development of civil aviation.

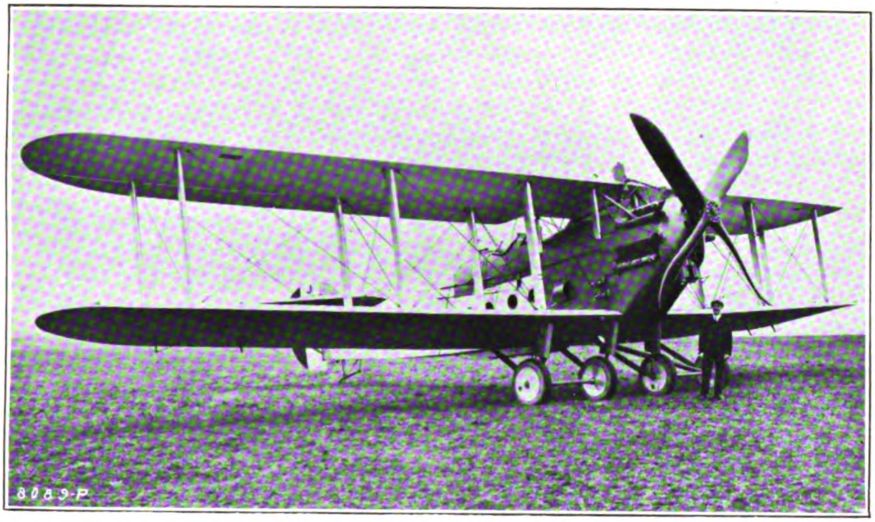
ENGINE CONSIDERATIONS.

The standardisation of engines at the end of the war was analogous to that of aeroplanes as represented by the structure only; that is to say, many designs were evolved under war conditions which were not suitable for civil requirements. The upkeep and running costs of these engines were necessarily rather large, and the life of the engine was not sufficient for civil aviation. The opinion is held by some that the design of an engine for civil aviation should be ample even if it involves the carrying of one passenger less. The weight of 3·9 lb. per H.P. is an average figure for an engine of 400 to 450 H.P. using fuel with 30 per cent. aromatics, and this figure would apply to an aeroplane with one, two, or three engines.

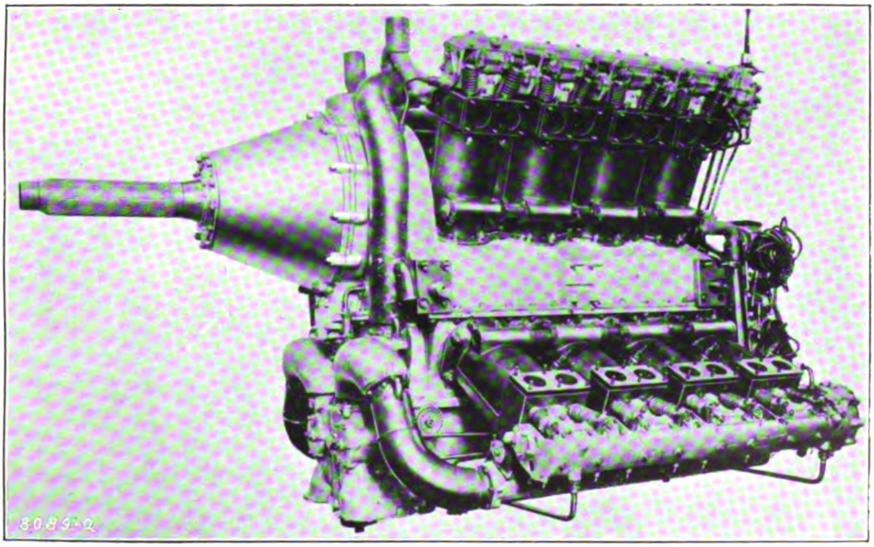
There has existed for a long time a controversy as to the relative values of air-cooled and water-cooled engines. Experience indicates, however, that the air-cooled engine will probably prove more economical for short-distance flying and the water-cooled engine for longer distances. The criterion is a matter of weight; the water-cooled engine having to carry additional weight in its cooling system.

FUEL AND OIL.

There are several kinds of fuel which may be used in aero engines, each having its respective efficiency and cost, and in deciding



AVRO ALDERSHOT AEROPLANE WITH 1000 H.P. ENGINE.



1000 H.P. NAPIER "CUB" AERO ENGINE.

which is the best for a particular service it is necessary to consider these characteristics conjointly; it is usually found that the most efficient fuel is, at the same time, the most expensive. Owing to the large quantity of fuel used, the cost becomes a serious factor, and as the length of flight is increased, the reliability of the engine, which is partly affected by the efficiency of the fuel, has specially to be considered. The problem, therefore, resolves itself into first obtaining knowledge of the flying requirements and then estimating the relative values of efficiency and cost.

One kind of fuel used is ordinary petroleum spirit without aromatics, and with this the compression ratio of the engine must not exceed 3·9 : 1. Another fuel, Persian spirit, contains 12½ per cent. aromatics and therefore leads to more efficient running, while Borneo spirit contains 30 per cent. of aromatics mostly of the toluene series, and the use of this fuel enables the compression ratio of the engine to be increased to approximately 6 : 1. The foregoing may be regarded as primary fuels, but others may be obtained by mixing petroleum spirit with benzol or alcohol, and the admixture thus obtained can be made nearly as efficient as the petroleum spirit with aromatics, and at a reduced cost. The objection to using these admixtures lies in the fact that benzol and alcohol cannot be obtained as easily as petroleum spirit, and in the event of war, both benzol and alcohol would be used considerably in the manufacture of explosives, and their availability for use as fuels would be consequently restricted.

The use of either benzol or alcohol alone has been considered. Alcohol can be obtained from many sources, tropical countries being potential producers of an almost unlimited amount. Any starch or sugar bearing substance forms a suitable raw material for the industry, and even the refuse of paper mills can be utilised for the manufacture of alcohol. A fairly satisfactory fuel is obtained by an admixture of from 10 per cent. to 20 per cent. of benzol to alcohol, with possibly a further 5 per cent. of ether added for high-altitude flying, which, of course, would not be necessary for civil aviation unless the routes passed over mountain ranges.

Little need be said on the subject of lubricating oils since there are a number of brands which are quite suitable for use in aero engines. It is necessary, of course, to choose one which is suitable for the climatic conditions likely to be encountered as well as for the type of engine in which it is to be used.

MATERIALS FOR CONSTRUCTION.

It is a well known fact that timber varies greatly in quality and it has therefore been necessary to use great discrimination in the selection of the material used for aircraft construction. Even a close inspection cannot always reveal small defects in timber, and it is very difficult to obtain a long spar which would give the same results if tested from end to end. Owing to the existing uncertainty as to the strength of timber it has been found necessary to employ a high factor of safety in the design of wooden structures, and this, of course, has the effect of increasing the ratio of weight to strength. It is these difficulties that have directed attention to metal construction, since metal is a much more homogeneous and reliable material.

As previously mentioned, the various qualities and characteristics of steel should be familiar to the aircraft constructor, and where any doubt exists, the requirements of the user should be made clear to the steel manufacturer so that he can supply a suitable quality. In the manufacture of aircraft steels the heat treatment is of fundamental importance. The steels required are usually those giving high mechanical test results, especially in tension, without displaying undue brittleness. The process of manufacture of aircraft parts calls for a large amount of working, sometimes in the cold, of the steel to be used, as for instance in the rolling of streamline wires. Careful treatment is, of course, required if the steel is to maintain its mechanical properties without cracking or developing minute flaws, and it is frequently necessary for steel parts to be annealed several times in the course of manufacture.

In a high tensile steel, suitable for drawing into very thin sections, the percentages of the principal constituents are as follow :—

Carbon	between 0·28 and 0·35 per cent.
Silicon	not more than 0·30 per cent.
Manganese	between 0·35 and 0·60 per cent.

No nickel or chromium is present in this steel, but those found suitable for engine crankshafts and connecting rods have the following compositions :—

	Crankshafts.		Connecting Rods.
Carbon . .	not more than 0·35 per cent.	Carbon . .	between 0·32 and 0·38 per cent.
Nickel . .	not more than 4·00 per cent.	Nickel . .	between 3·00 and 3·75 per cent.
Chromium .	between 0·5 and 1·3 per cent.	Chromium .	between 0·5 and 1·00 per cent.

Aluminium alloys have been investigated for the manufacture of engine crankcases, but so far results have not been satisfactory, the difficulties encountered arising mainly from the complicated designs into which these parts have to be formed. To overcome these difficulties the use of aluminium forgings to replace castings has been investigated, and forgings of aluminium have been used with success in the manufacture of pistons.

In the past rubber has been largely used in aircraft construction, particularly for shock absorbing devices and for tyres. Its use for the latter is practically established, but for the former, rubber has been supplanted by other materials which are equally resilient and less liable to deterioration. It appears that soft rubber, such as may be used for shock absorbers, is an unstable compound, and in the course of time the structure of the rubber changes and cracks develop; this action is accelerated when the rubber is exposed to sunlight. In spite of this rubber is still used considerably in aircraft, and its efficiency is maintained by careful treatment and by the avoidance of prolonged exposure to direct sunlight.

In fuel systems, rubber has been used for pipe joints, but owing to the destructive action of petrol on rubber a new component known as petrol-resisting rubber was devised and made into tubing for pipe joints. A further step has now been made by the construction of an all-metal pipe joint which will abolish rubber altogether for this purpose.

METAL CONSTRUCTION.

The advantage of metal over wood has been touched upon previously, when it was pointed out that the homogeneity of metal is an asset when calculating stresses in a structure, the uncertainties of timber needing a large factor of safety with the consequent increase in weight for a given strength. All-metal wings and all-metal aeroplanes have been constructed having a lower weight than a corresponding aeroplane made of wood and metal. A difficulty, however, occurs in deciding which metal is most suitable for the purpose. Aluminium alloys have proved unsatisfactory on account of their liability to corrosion; not corrosion on the open surfaces, but at joints where the defect is not visible and is consequently more serious. The danger of corrosion has been reduced, if not eliminated altogether, by a process devised by Dr. Aitchison. This process consists of depositing by anodic oxidation a coating of hydroxide on the surface of the alloy. The film thus formed clings tenaciously to the surface of the metal, and is practically impervious; it is also slightly flexible. Immediately after the anodic oxidation, the surface is coated with lanoline or other suitable grease, and this coating is held firmly by the surface deposited on the metal.

Aluminium alloys have the advantage in specific weight, but owing to their smaller strength in comparison with steel, they lose their advantage when compared on a gross weight basis. Steel has been tried for aircraft construction, but in this case the difficulty is to produce thin sections and abrupt change of section without introducing minor cracks at the edges. Under certain conditions aluminium alloys would be preferable to steel, this being the case in the construction of flying-boat hulls. These hulls, if made of steel, would be of ample strength in the air, but might not be sufficiently substantial to withstand the shocks experienced when riding on a rough sea.

Many designs of all-metal aeroplanes have been considered, but, in general, the designs have been too complicated. They have satisfactorily fulfilled the requirements for safety and strength, but the processes of manufacture have been made tedious and costly by the use of a very large number of rivets, most of which have to be inserted and closed by hand. All-metal construction will doubtless eventually prove itself to be superior to timber construction, but one of the criteria for its successful development must be the modification of existing workshop processes to meet the requirements of mass production. At the present time it seems probable that the most satisfactory aeroplane structure will be a compromise between the two methods of construction.

For bulk production, it may be said that metal has a great advantage over timber when the aircraft is to be used abroad under climatic conditions differing from those of the country in which it was manufactured. The behaviour of timber under varying conditions of temperature and humidity is very erratic, as was well exemplified in the early days of artillery, when it was found that the wooden wheels for gun carriages made in England were quite useless when assembled in India. The obvious remedy for this difficulty lies in manufacturing the aircraft in the country in which it is to be used; but this applies only to aircraft of timber construction.

INSTALLATION MATTERS.

After an aeroplane structure has been completed, a considerable amount of work remains to be done in fitting and storing the various items of equipment to suit the duty to be performed. On a service aeroplane, guns, cameras, wireless apparatus and the like are required, but on civil aeroplanes the installation of the wireless equipment is the most important consideration.

The location of petrol tanks has been modified as a result of experience, the tanks now being fitted in an outboard position on the wings instead of inside the fuselage or hull. In this position the danger of fire is minimised, as it has been proved that a petrol tank may take fire on a wing without any serious consequences. The outboard position of the tanks is particularly advantageous in the event of a crash, as the petrol is kept away from the hot parts of the engines, and is thus not likely to ignite. Another advantage is that a gravity feed is assured with the tanks in this position, while the flying qualities of the aeroplane are not impaired.

AERODYNAMICS AND PERFORMANCE.

One of the most important problems in aeroplane design is that of obtaining the most suitable section for the wings. Ordinary aerofoil sections may give a high lift or a high speed, but do not, in general, give both characteristics. Much research work has been carried out in an endeavour to overcome this difficulty by the production of a variable section. In this way a high lift may be obtained for getting off, and when in the air the section may be altered to give high speed. The devices produced for this purpose have taken the form of slots in the aerofoil, in the direction of its length and located near the leading edge, and of a movable flap extending along the trailing edge. The latter has been used on certain seaplanes to provide the necessary variable camber, but the use of slots has not yet been developed very extensively, and the value of this device is not fully known at present.

Speaking generally, it requires some 500 H.P. to lift an aeroplane carrying a useful load of 2,000 lb. off the ground, but for flying, under cruising conditions, the engine need not develop more than 350 H.P. With a variable-camber wing, a 350 H.P. engine would suffice to get the aeroplane off the ground, so that, assuming the weight of the engine to be 3 lb. per H.P., the saving in weight effected by the use of the variable wing amounts to 450 lb. This is equivalent to the weight allowed for 2½ passengers, and is consequently a matter of considerable importance from the point of view of commercial aviation.

ADVANTAGES OF VARIABLE-LIFT WINGS.

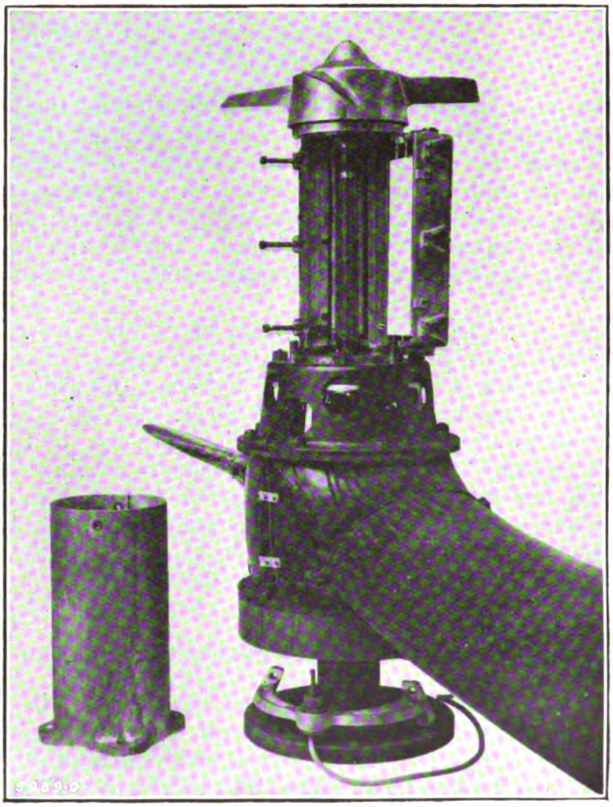
As an alternative to the use of a variable wing for the purpose of obtaining a higher lift, the same device may be used to reduce the minimum speed at which a machine can fly. Recent tests have shown that the minimum speed, which is, of course, the landing speed, may be reduced by 20 per cent., and the length of run required to "get off" or to land by about one-third. This results in increased safety on the ground and would also enable smaller aerodromes to be used.

The use of wings of variable camber would also enable the maximum height to which a machine can rise to be increased, and a speculative design has been suggested by means of which it would be possible for a machine to rise to 60,000 ft. At that altitude, the air resistance would be very low, and if the power of the engine could be maintained by some method of super-charging the speeds reached would be very high. It is conceivable that such an aeroplane might be constructed with a totally-enclosed cabin suitably heated and supplied with oxygen and be capable of speeds of the order of 400 to 500 m.h.p.

EXPERIMENTS ON PRESSURE DISTRIBUTION.

Considerable research work has been carried out in order to determine the distribution of air pressure over the surface of an aeroplane wing in flight. This is carried out by fitting into the wing of an aeroplane a large number of small tubes with their outer ends flush with the surface, and their inner ends connected to manometers in the fuselage. By adding the results of the measurements obtained from various positions it has been possible to estimate the total force on the wing under various conditions of flight. By similar means the air flow round the airscrew has been investigated. In this case the experimental difficulties were very great, and the apparatus illustrated on the next page has been produced. It is hoped by its use to determine a number of the characteristics of airscrews. Exceedingly interesting and valuable results have already been obtained, but the work is far from complete.

From the illustration referred to it will be seen that the airscrew blades are fitted with small steel tubes running along the length of the blade and opening into the surface along various pressure sections. These tubes are connected to a bank of small glass tubes containing mercury, and the air pressure at any point is indicated by the position of the mercury in the glass tubes. To obtain collective data for a given section of the airscrew, the position of the mercury in each of the glass tubes is indicated simultaneously, and this is done by producing a shadowgraph of all the tubes on photographically sensitive paper. The sensitive paper is moved relatively to the glass tubes by means of a small windmill placed in front of the airscrew, and the rate of progress of the paper may be adjusted as required. The whole of the measuring apparatus is enclosed in a shield and is carried in front of the airscrew.



APPARATUS FOR MEASURING AIR PRESSURES ON AIRSCREW BLADES.

LOW-SPEED CONTROL RESEARCH.

A line of research in which much work has been done recently has been in connection with the attempt to render aircraft more readily controllable at the low speeds obtained when the wings are inclined at a much greater angle to the horizontal than is the case in normal flight. When this has been accomplished it will be possible for a pilot to reduce the speed of the machine to the absolute minimum and yet land in safety, while at present it is necessary for the machine to land at a speed which is a few miles per hour greater than the comparatively high minimum flying speed. In addition, improvements in low-speed control increase the capacity of the aircraft for manœuvring in the air. The necessary investigations have been carried out both by wind channel research and by experimental flying, and it has recently been found possible to fly standard aircraft with modified control surfaces at angles of incidence which even a year ago would have been regarded as extremely dangerous.

WIND CHANNELS AND THEIR WORK.

The wind channels used in aeronautical research work take the form of a large rectangular tube through which air is drawn by means of an airscrew driven by an electric motor. The model to be tested is suspended in the centre of the tube from a balance which enables the forces acting on the model to be measured with considerable accuracy. The cross-sections of the channels vary from 3 ft. square up to 14 ft. by 7 ft., the latter being the dimensions of the large channel recently completed at the National Physical Laboratory, and illustrated on the Plate facing p. 126. Wind speeds through this channel up to 140 ft. per second can be obtained, and models of complete aircraft up to one-fifth full size can be tested. In large models such as these it is possible to mount an electric motor, for the purpose of driving the airscrew of the model so that the effects of the slip stream can be investigated. The tests carried out supply data for estimating the performance and stability of the full-size aircraft with good accuracy. The pressure distribution and the loads carried by the various components can be measured to assist in design calculations, and the characteristics of airscrews can also be determined. Whenever possible wind-channel results are checked by full-scale tests in order to ascertain the effect of change of scale. Apart from the value to designers of the general data obtained in this way, wind-channel tests are often extremely useful in enabling the merits of specific ideas to be investigated on a model. The cost of such investigations is obviously but a small fraction of that involved in the construction or alteration of a full-sized machine.

The performance of aeroplanes has been increased considerably since the war by research methods, and Table I., on page 136, has been included to enable a comparison to be made between the performances of various types of military aeroplanes in the early stages of the war, in 1918 and at the present time.

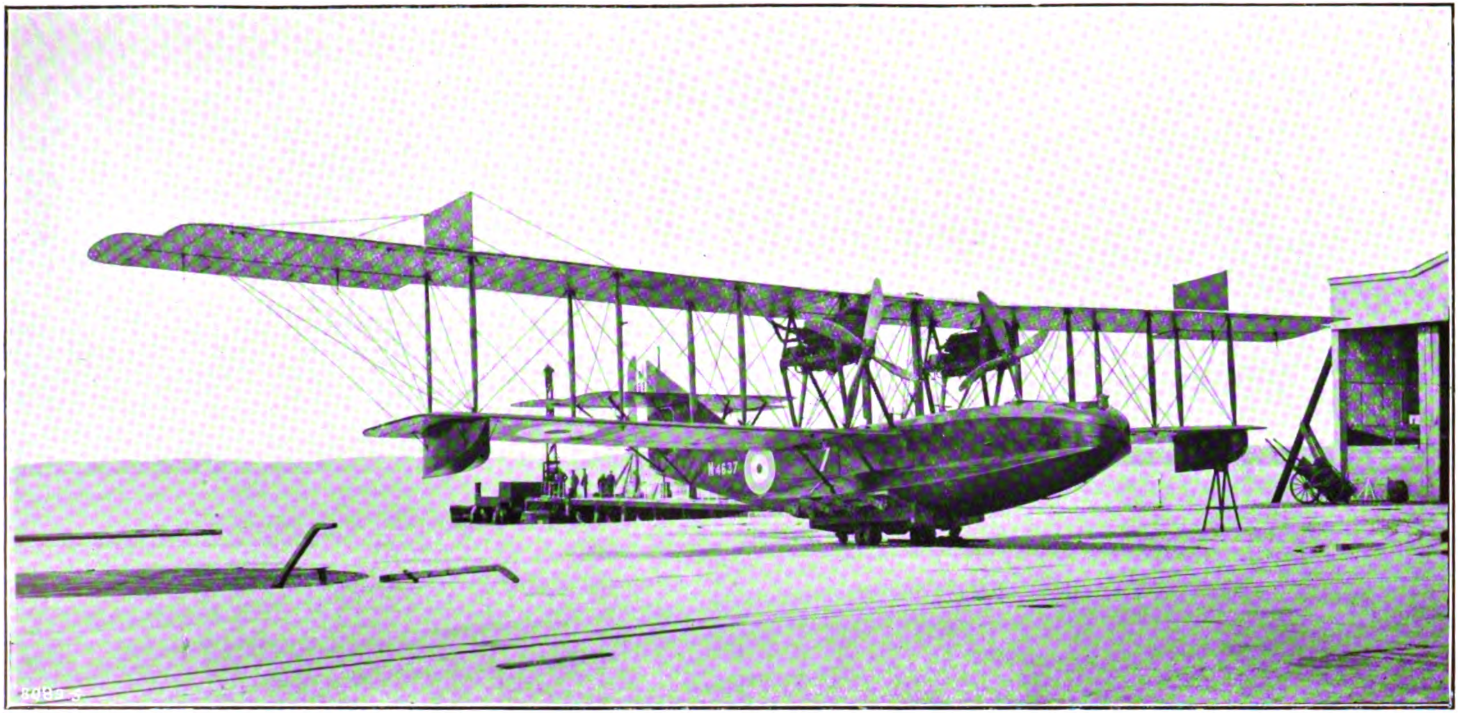
STRUCTURAL STRENGTH.

The strength of the structure of an aeroplane is obviously an important feature in the design. The strength standard is defined by a quantity known as the "load factor," which indicates the number of times its own total weight an aeroplane structure can support without failure. This factor varies from 4 in the case of large slow-speed aircraft up to 7 in the case of highly manœuvrable aeroplanes such as fighting scouts. The figures are based on past experience and calculations and on the results of model experiments, and are kept as low as possible, consistent with safety, in order to reduce the weight of the machine and so increase its carrying

TABLE I.—IMPROVEMENT IN PERFORMANCES OF MILITARY AEROPLANES.

Name.	Engine.	Speed, m.p.h.	Air endurance (hours).	Radius of action (miles).	Period.
SINGLE-SEATER FIGHTERS *					
Bristol Scout	80-H.P. Le Rhone	at 10,000 ft 86·5	2½	106	Early stages of war.
S.E.5	200-H.P. Viper	at 15,000 ft. 117·5	3	176·25	1918
Camel	110-H.P. Le Rhone	108·5	2¾	150	do.
Dolphin	200-H.P. Viper	116	2¼	125·5	do.
Snipe	230-H.P. B.R.II.	113	3	169·5	do.
Land Fighting Machine	320-H.P.	at 15,000 ft. 142	2	142	Present time.
Ship Fighting Machine	320-H.P.	138	3½	241½	do.
TWO-SEATER FIGHTER OR RECONNAISSANCE MACHINES *					
B.E.2.b.	90-H.P. R.A.F.1.A.	at 10,000 ft. 69	3¼	112	Early stages of war.
F.E.2.b.	120-H.P. Beardmore	72	3	108	do.
R.E.8	150-H.P. R.A.F.4.A.	93	4¼	147½	do.
D.H.4.	250-H.P. Rolls Royce	at 10,000 ft 113	3½	198	1918
D.H.9	230-H.P. Puma	109	4½	245¼	do.
D.H.9.A.	400-H.P. Liberty	114	6	342	do.
Unnamed	500 H.P.	137	5	287½	Present time.
HEAVY BOMBERS *					
D.H.10	2 400-H.P. Liberty	at 10,000 ft. 113½	4	227	1918
H.P. 0/400	2 275-H.P. Rolls Royce	80	8 (at 6000)	350	do.
Vimy	2 359-H.P. Rolls Royce	96	4¼	204	do.
Virginia	2 465-H.P. Lion	at 10,000 ft. 95	12½	600	Present time.

* NOTE.—Increase of speed is essential in fighting aeroplanes, while increase of range and weight carried is the chief desideratum in heavy bombers; no aeroplane of the latter class was in existence in the early stages of the war.



F 5. BOAT-TYPE SEAPLANE.

capacity. For the same reason, more refined methods of calculation are necessary than are commonly employed in other branches of structural design. Minor details, such as bracing wires, etc., are very largely standardised, but standardisation cannot be used to the same extent as in other branches of engineering work owing to the necessity for keeping the weight of the structure down to the minimum. Research into structural problems is continuing along two lines:—firstly, with the object of standardising stressing methods and extending knowledge of the properties of materials and the principles of structural design; and secondly, aerodynamic investigations are being made into the possible loads that may be imposed upon the structure in flight. Strength tests of component parts are useful in the case of structures of so complicated a nature that calculations are not reliable, and these tests have proved of special value in connection with the use of new materials of construction such as thin steel strip, a material which has produced several new problems relating to local failure.

LANDING IN FOGGY WEATHER.

Various devices, some of which have been partly successful, are being tried to enable aeroplanes to land in foggy weather, which must still be regarded as one of the more pressing problems to be solved in connection with the development of aerial transport. One of the difficulties in this matter is that whatever device is used the rapidity with which events occur in the course of landing an aeroplane is such that the pilot can pay but little attention to any particular instrument or indicator, and therefore prefers to rely upon his flying sense. Experiments are continuing which it is hoped will lead to the production of a successful device to enable an aeroplane to land safely in any condition of visibility.

AMPHIBIANS AND SEAPLANES.

Research has done much towards the development of seaplanes, and successful amphibians have also been constructed which can take off from and alight on either land or water with equal facility. Machines of the latter type are fitted with a retractable undercarriage, which can be let down when the machine is to land on the ground and drawn up when it is necessary to alight on the water. Such an aircraft can alight on the sea, "taxi" to the beach, and ascend the foreshore under its own power. There are two types of seaplanes in use, one an ordinary aeroplane structure fitted with floats instead of wheels, and the other a boat-built hull provided with wings. Each has its own particular merits and both have been used considerably, but generally speaking the boat type is more suitable for open sea work and the float type for use in more sheltered waters. The forms of the hulls of boat seaplanes have been largely influenced by research, numerous experiments having been carried out on models both in wind channels and in the experimental tank at the National Physical Laboratory. Having decided upon the external form, the structures are built internally to withstand the stresses imposed both in flight and on the water, and it may be noted, in this connection, that in the case of boat seaplanes the stresses which occur in the hull when the aircraft is riding on a rough sea are higher than those to which it is subjected in flight. Up to the present seaplane hulls have been constructed of wood, but it is now proposed to develop a flying boat hull of metal construction.

GLIDERS AND LOW-POWERED AEROPLANES.

The construction of gliders and low-powered aeroplanes has recently been encouraged by competitions, and very interesting results have been obtained. The Air Ministry have acquired a light aeroplane fitted with a 3½ H.P. engine, and this little machine has reached an altitude of 3,000 ft., and covered a distance of 87 miles with a consumption of only one gallon of petrol. These aircraft are of considerable value for training flying *personnel* at a much lower cost than that incurred by using high-powered machines, and they are also useful for experimental work. An aerodynamic experiment may cost from £200 to £300 for wind-channel work, and the subsequent full-scale investigations from £5,000 to £10,000, but a low-powered aeroplane of the type referred to would probably give the required data at a cost of some £400 to £500, with the additional advantage that the scale effect would be much less than with a wind-channel test on a model.

CONCLUSION.

It is perhaps hardly necessary to point out in conclusion that the brief account given in this chapter of the experimental and research work in aeronautics now being carried on in this country is very far from being of an exhaustive character. Many important and highly technical investigations now in hand have not been referred to, either because they affect detail design rather than general principles, or because the work is mainly of a theoretical nature, and has not yet advanced sufficiently to indicate the exact direction which its practical application will take. The writer's endeavour has been to give a general explanation of the present position of research and design in aircraft engineering, and to indicate some of the directions in which progress may be anticipated in the future. He is convinced not only that this progress will amply repay the present comparatively trifling expenditure on research and experiment, but that the rate of progress would be materially accelerated if the sum allotted to it annually could be increased.

R. K. BAGNALL-WILD.

CHAPTER VII.

THE PROGRESS OF DIRECTIONAL WIRELESS.

WIRELESS telegraphy is based upon the fact that rapid reversals of the electric current in a conductor create electric waves which, after travelling through space, can produce to and fro currents in any conductor they fall on. One way of obtaining rapid reversals of current is to discharge electricity by means of a spark from one conductor to another, and since these oscillations die down before the next spark can occur this method is called damped-wave telegraphy. But rapid reversals can be produced in other ways: for example, by machines called alternators which produce them in a perfectly continuous stream; this method is called continuous-wave telegraphy. In either method the frequency of reversal may be anything between ten thousand and thirty million per second, or, in other words, the wave-length may be anything between thirty thousand metres and ten metres.

A vertical aerial conductor, like a lightning rod, presents the same aspect towards all points of the compass and therefore an alternating current flowing up and down it emits waves in all directions equally. We may suppose that each upward current produces a crest, each downward current a trough, of the waves. Electric waves produced in any manner travel through the air like light, at the speed of 180,000 miles per second. When they wash across any conducting wire, the crests and the troughs succeeding one another produce upward and downward currents in the wire. Thus the frequency of these electrical oscillations is exactly the same as the frequency of the original oscillations in the aerial from which the waves come. A conductor specially arranged to respond well to the waves is called a receiving aerial; and when the aerial is adjusted to the most sensitive condition it is said to be tuned to the sending station.

THE MAKING OF SIGNALS.

The feeble high-frequency currents in a receiving aerial have no direct effect on a telephone, which appeals to the ear, or a galvanometer, which appeals to the eye, because the up and down currents are so rapid that they cancel each other in these instruments. Therefore a special instrument called a detector had to be invented to assist the telephone or galvanometer to chronicle the arrival of the waves. Most modern detectors do their work by a process called rectification, which can be described as the picking out of the upward currents and the suppression of the downward currents in the receiving aerial or associated circuits. This so-called rectified current is thus all in one direction, and is therefore capable of affecting a telephone or a galvanometer. We can now see that the essential processes in making signals, for example by sparks, are as follows:—A single spark in the transmitting aerial produces temporary strong electrical oscillations in it which cause electric waves to start out in all directions, spreading their energy over a gradually increasing area. A minute amount of this energy reaches the receiving aerial and creates a short-lived up and down oscillation which is a fairly good imitation, on a small scale, of the original short-lived oscillations in the sending aerial. The detector picks out, say, the upward currents and hands the result to the telephone. This produces a click which is heard by the operator and is in fact a reproduction of the spark of the sending station. Two successive sparks make two successive clicks and a shower of sparks at the sending station give a musical note in the telephone, if more rapid than, say, 40 per second.

DIRECTIVE AERIALS

If the receiving conductor is vertical it reacts equally to waves coming from every direction; in technical parlance a vertical aerial is non-directive. In fact any aerial symmetrical about a vertical axis—for example, one shaped like an umbrella with a metal stick and ribs—is non-directive. But if a single wire, or a bundle of more or less parallel wires, leans away from the vertical, say in the north and south direction, it will absorb more energy from waves coming from the north or south than from waves coming from the east or west; in other words the aerial becomes directive. A typical directive aerial of this type is sketched in Fig. 1, where a number of parallel wires are supported horizontally by insulators from two wooden masts and the lead down goes from one end of the wires to the tuning and detecting apparatus in the house. This "L" antenna, as it is called, is most strongly excited by waves travelling from A to B, nearly as strongly by waves moving from B to A, and much less strongly by waves coming more or less perpendicularly.

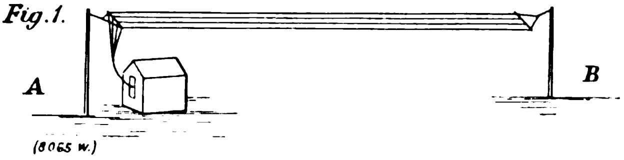


Fig. 1.

But an antenna such as this, with its free end suspended in the air, is only one type of directive aerial. Quite a different type is obtained by arranging the conducting wires in the form of a coil. The wire may be wound on a wooden frame as shown in Figs. 2 and 5, pages 141 and 143. The two ends of the wire are taken to tuning and detecting apparatus of a very similar nature to that employed with an antenna. This new form, which is sometimes called a frame aerial, is affected by waves in the following way. First, suppose the waves to be coming broadside on, then any crest will reach the vertical wires at A (in Fig. 5) at the same instant that it reaches those at B. The tendency is to create an upward current in both A and B, and thus the tendency to produce a circulation of current in the coil is nil. Moreover, the waves cannot produce any effect in the horizontal wires. Therefore, on the whole, waves travelling perpendicularly to the plane of the coil produce no signals. Next, suppose the waves coming in the direction A to B. A wave crest will pass A a fraction of a second before it passes B, and this slight difference in time will be sufficient to prevent complete cancellation of the electric forces in the two sides of the coil and to ensure that to and fro circulating currents will be set up. Similar reasoning applies to waves moving in the direction B to A. To sum up, briefly, the strongest signals will be received by a frame aerial when its plane points to the sending station; there will be no signals heard when its plane is perpendicular to that direction, and the signals will be of intermediate strength in intermediate positions.

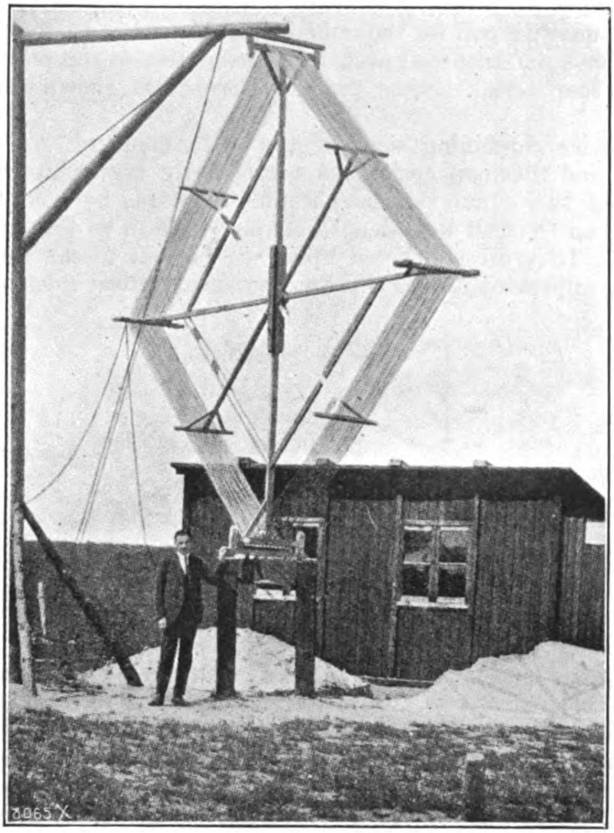


FIG. 2.

Other things being the same, the strength of the signals received on an upright coil may be increased by making the coil of greater area or by giving it more turns of wire, but the length of wire that may be used is limited by the wave-length of the signals so received. But supposing that the utmost length of wire be used, it is found by experience that a large coil of one turn gives stronger signals than a small coil with many turns. At its best, however, a coil can gather only about a tenth of the energy picked up by the same amount of wire used as a vertical antenna. It seems that some sacrifice has to be made in order to obtain the desired property of directiveness. A bent antenna, at its best, is intermediate between the vertical antenna and the one-turn coil for the same length of wire. In the following paragraphs a one-turn coil used for transmission or reception will be called a loop aerial. Some practical forms are shown in Figs. 3 and 4.

A device combining some of the advantages of the vertical antenna and the loop aerial has occasionally been employed. It consists of two equal vertical antennæ separated by a distance not greater than the half wave-length of the waves to be transmitted or received. They are connected up at the bottom to the tuning and detecting apparatus just as if there were two vertical sides of a loop.

Fig. 3.

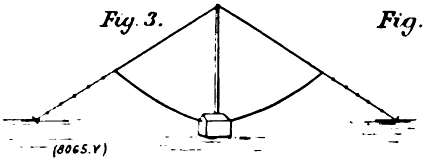
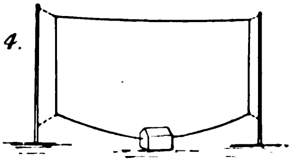


Fig. 4.



In fact, the device is a loop aerial devoid of the upper horizontal wire. It operates on the same principle as the loop, and has similar properties.

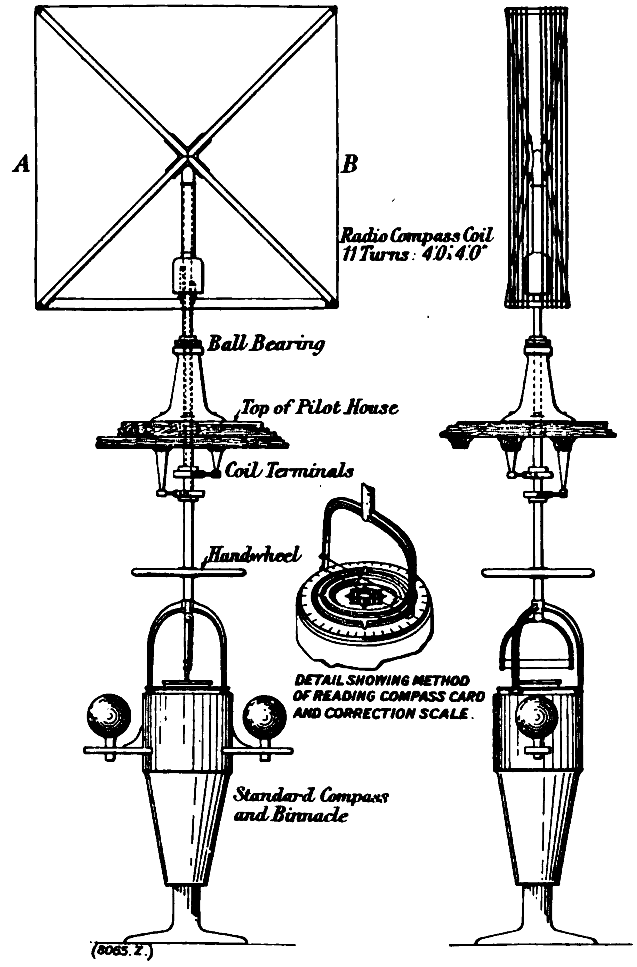
A Mechanical Analogy.

Perhaps a mechanical analogy will help the reader to remember the main electrical facts. Suppose the glass bulb of a spirit level to be mounted in a wooden rod like a walking-stick that will float it in water, and that the instrument is taken to a quiet lake. Now suppose that by some means or other waves are made of such dimensions that the distances between successive crests are considerably greater than the length of the rod; then the rod will pitch if the waves meet it end on, will roll if they come broadside on, and will partake of both motions in other cases. When it pitches in response to end-on waves, the bubble in the spirit will move to and fro along the tube, but when it rolls there will be no such motion. Therefore an observer who is blind to everything but the motion of the bubble will be able, if he wishes, to determine the line of travel of the water waves by pointing the rod in various directions; he could find the position in which the motion of the bubble was greatest or that in which it was zero. In the former case, the line of travel of the waves is the same as the axis of the rod, in the latter it is perpendicular to that axis.

Probably the broadside method would give the more accurate estimate of the line of travel of the waves, but neither method would enable the observer to say in which direction along that line the waves were travelling.

The wireless operator is necessarily in much the same position as the observer who has to concentrate his attention on the bubble of the spirit level, for electric waves are imperceptible to his senses. Moreover, if he can rotate his bent antenna or his frame aerial, he can determine the line of travel just as the spirit level did for the water waves. The accuracy obtainable is greater when the angle of minimum signal strength is sought rather than the angle of maximum signal strength. Also, the wireless operator, if provided with apparatus no further advanced than that described in former paragraphs,

Fig. 5.



is unable to say, after finding the line of travel, whether the sending station is in front of or behind him.

Many of the electrical facts stated above with regard to aerials for reception are true, *mutatis mutandis*, for transmission. An inclined or partly horizontal antenna, a frame aerial, a pair of separated vertical antennæ, all emit waves more strongly lengthwise than transversely. And wireless schemes for navigation of ships and aircraft employ sometimes directive transmission, sometimes directive reception, and sometimes both. We pass on to consider some of the principal schemes.

THE FIRST NEED IN DIRECTIVE TELEGRAPHY.

The fundamental need in directive telegraphy, either for transmission or reception, is to be able to rotate the antenna or frame, or to do something equivalent to rotation, as is explained later. A frame aerial with many turns of wire, as in Fig. 5, is very compact, and is therefore easily constructed for rotation about a vertical axis. As already stated, the signals obtained by its aid are much weaker than could be obtained if the wire were in a single turn, but since the development of satisfactory amplifiers, small coils rotated easily by hand have been used more than all the other devices put together. It is more difficult to arrange for the rotation of a loop aerial as in Fig. 4, page 142, but patents have been taken out for schemes in which one or both of the supporting towers have been mounted on wheels that roll on circular railways. Such plant is, of course, more cumbrous in manipulation than a small coil, but for transmission purposes the large aerial is a more powerful radiator, and for receiving purposes it might serve without an amplifier.

Fig. 6.

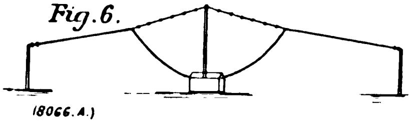
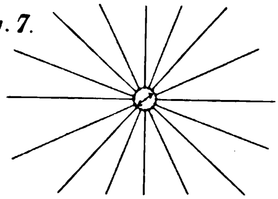


Fig. 7.



In practice, the use of such cumbrous machinery has been avoided by various ingenious means. One of the earliest devices consisted of a radial arrangement of equal bent antennæ, spaced equally in angle as shown in Figs. 6 and 7. In this, the inner ends of the horizontal wires are supported by insulators from a central mast, and the outer ends are similarly supported from poles standing in a circle. The down leads are brought separately to points on a rotary switch which is under the control of the operator. In any one of its positions, the switch connects two opposite antennæ to the indoor apparatus, and, therefore, by rotating the switch, any pair of opposite antennæ can be selected for use. The same mechanical principles can easily be applied to a compound antennæ made up of a series of upright loops like those of Figs. 3 and 4 fixed radially. When any such scheme as this is in use for finding the direction of a distant sending station, the switch is rotated until the position of weakest (or strongest) signals is found.

THE RADIO GONIOMETER.

Another method of obtaining the effects of rotation without bodily movement of any part of the antenna, has been given the name of radio goniometer. In this apparatus, two upright loops or coils, of square, triangular or any other shape, are erected so that one points north and south, and the other east and west, as indicated in Fig. 8, and wires from each are led separately into the station house. These wires are connected to two small upright coils fixed on the operator's table parallel to their respective loops. When the loops are excited by waves, their currents flow through the corresponding indoor coils and co-operate there to induce a resultant current in an inner movable coil, called the search coil, which can be rotated by hand round a fixed vertical axle as shown in Fig. 9. This inner coil, which may be only a few inches in length, is manipulated in exactly the same way as the frame aerials in the more direct method already described, and a pointer attached to it and moving over a compass card indicates the line in which the waves are travelling. Conversely, the apparatus can be used for transmitting by supplying power to the moving coil in order to induce oscillatory currents in the two loops; when the small coil is rotated the direction of strongest emission rotates with it.

Fig. 8.

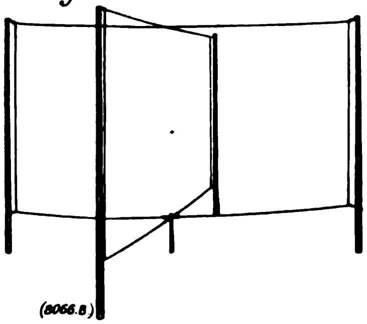
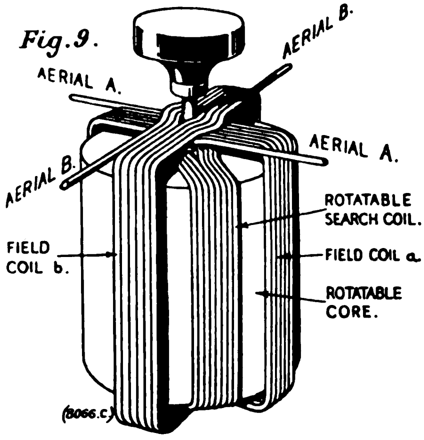


Fig. 9.



HERTZ'S EARLY EXPERIMENTS.

The principles enunciated in the preceding paragraphs were all prominent in the experimental researches of Hertz carried out in 1887 and 1888. Another great principle involved in those important researches is that of reflection. Electric waves were reflected and focussed by Hertz and transmitted across short distances just like rays of light. From these experiments we know that if a straight vertical aerial were half surrounded by a rotatable parabolic metal mirror, the waves could be directed as a parallel beam to any distant station, spreading neither to the right nor the left. But the mirror must be several times larger, in its horizontal dimension, than the waves in use. Thus, waves 1,000 metres in length, such as might be used with the apparatus already described, would require mirrors several miles long. This is quite feasible for work in a fixed direction, but evidently in order to utilise the mirror principle in apparatus that can be turned in any direction, short waves must be employed. Those used by Hertz were about a metre in length, but it is quite practicable nowadays to use waves as long as twenty metres. The recent advances in the general technique of wireless has prompted experimenters in both England and America to return to the rotating mirror method, and a practical form of the apparatus has recently been developed by Mr. C. S. Franklin, of the Marconi Company.

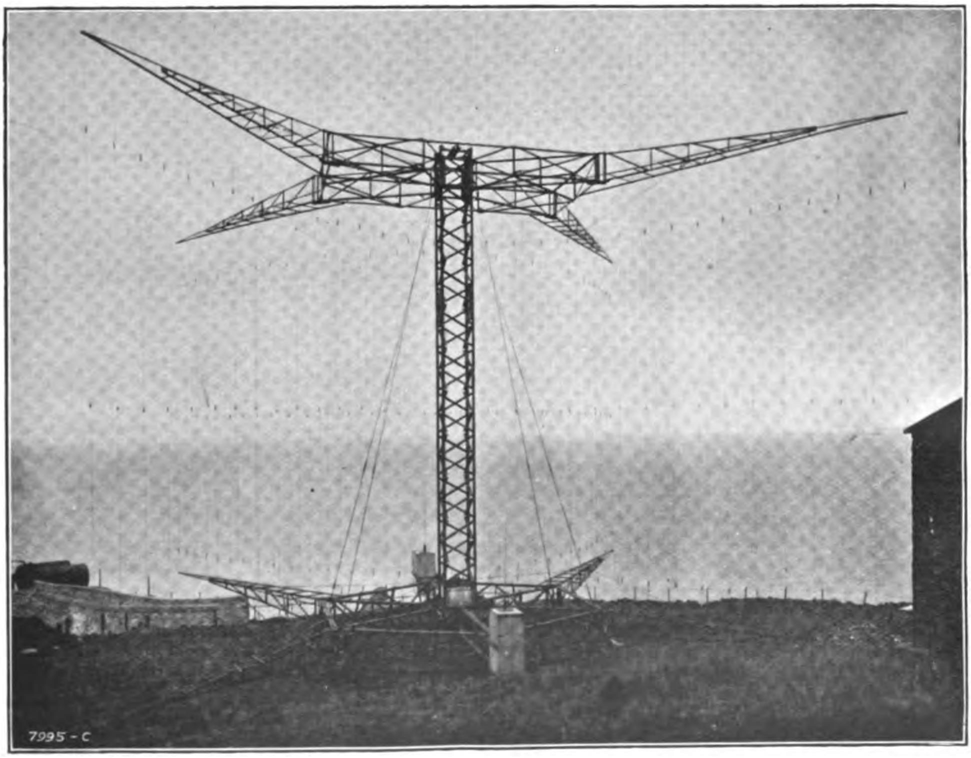


FIG. 10.

THE "WIRELESS LIGHTHOUSE" AT INCHKEITH.

In this development, the mirror is formed of a number of parallel vertical wires fixed on a horizontal parabola and the antenna is a straight vertical wire placed in the focus of the parabola. In the plant erected at Inchkeith, continuous waves are generated by triode valves, which produce 300 watts of radiation at a wave-length of

15 metres. The skeleton mirror is much more effective as a reflector than would appear to non-electrical persons, and possesses the advantage that it offers little mechanical resistance to the wind. This radio-phare, or wireless lighthouse, is shown in Fig. 10, and is the first of its kind. It has a central lattice tower 30 ft. high supporting four horizontal metal arms which hold the skeleton mirror. The whole structure is continuously rotated as a rigid body by a motor and emits characteristic signs as it passes certain points of the compass. Thus a mariner provided with suitable receiving apparatus learns the angle from true north in which the beam is pointing when it sweeps over his ship, and from this he gets immediately the bearing of the radio-phare.

DIRECTIONAL WIRELESS AND NAVIGATION.

Broadly speaking there are three methods of aiding navigation or of determining position by means of apparatus utilising the principles surveyed in preceding paragraphs. The first and simplest method is to erect charted wireless beacons on shore which will each send out characteristic signals continuously, or at frequent intervals of time, and to provide every ship with a direction-finding receiving set. The passing mariner may then take bearings on such wireless beacons as are useful to him, and by plotting the cross-bearings on a chart the position of a ship is found. The process is analogous to taking cross-bearings of visible lighthouses at harbour entrances.

The second method requires no special apparatus on ships, but depends on the installation of charted direction-finding stations on shore. When a navigator desires information about his position, he gets into touch with one or more direction-finding stations by ordinary wireless and asks it, or them, to take his bearing while the ship sends signals. The direction-finding stations then transmit the measurements to the navigator, who, if he has two or more results, can plot the cross bearings on his own chart and get his position. The process is analogous to finding the position of a visible ship by triangulation with theodolites at the ends of a base line on shore, but the wireless method can be applied when the ship is far below the horizon.

The third method employs directive sending stations called radio-phares, situated at charted points. Each radio-phare continually makes signals, such as single dots, and is provided with mechanism which produces continuous rotation at a speed which is published. Every time that the direction of strongest emission lies north and south a special signal is made, and if a mariner hearing this signal counts the number of seconds that elapse until the dots appear strongest, he can deduce his bearing from the radio-phare. A similar bearing on another radio-phare would enable him to mark his position.

DIRECTIONAL WIRELESS IN OPERATION.

Some practical experience of these methods will now be given. The first, or radio-beacon, method has been very thoroughly studied by Kolster and Dunmore, of the Bureau of Standards, Washington. The direction-finding apparatus they used in one of the ships is shown in Fig. 5, in front and side elevation. The results of some of the trials with apparatus of this type are shown in Fig. 11. It will be seen that beacons at distances of ten to twelve miles were employed during this test, and that the ship's position was found with an error of only a few hundred yards. As a rule, great confidence may be placed on results obtained in the daytime if the triangle of intersection, sometimes called the "cocked hat," is small. But in order to obtain this accuracy, certain corrections have to be made which eliminate the effects of the metal masses of the ship. These errors are very analogous to the quadrantal errors of a magnetic compass, as was indeed found at an earlier date (1918) with apparatus of the radio-goniometer type fitted on board H.M.S. Warspite, as shown in Fig. 12, taken from a paper by Captain H. J. Round, in the *Journal of the Institution of Electrical Engineers.*

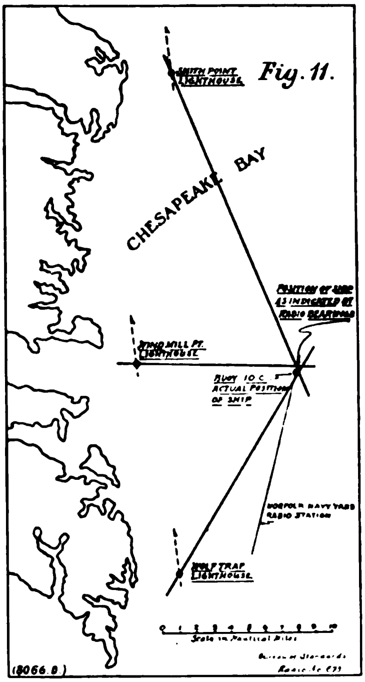


Fig. 11.

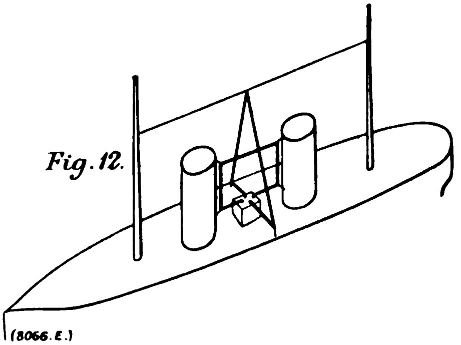


Fig. 12.

The same method will serve over longer ranges than those mentioned in the last paragraph, when powerful beacon stations are available; but, in this case, if the observed bearings were plotted on a Mercator chart, serious errors would arise because great circles on the globe are not straight lines on the Mercator projection. Charts on the gnomonic projection are, however, obtainable, and should be used if possible. Alternatively a special mercatorial correction can be applied to the observed bearing as shown in the next paragraph in an illustration of the shore direction-finding method.

EXISTING DIRECTIONAL STATIONS.

The second method, which employs shore direction-finding stations, is more used than any other, since it is the official method of several administrations. Any type of direction-finding apparatus may be installed. Each station may be fitted with transmission gear so as to have independent communication with ships, or a number of direction-finding stations may be connected by land lines or cables and controlled by one station equipped with sending apparatus for communication with ships. The four British stations for ships are the Lizard, Carnsore, Flamborough, and Berwick, and are independent. Any ship desiring to learn its bearing from one of these stations first gets into touch on 450 metres; then, when instructed, it sends its call sign for 60 seconds, and awaits the result. Upon receiving the bearing measured at the direction-finding station, the ship repeats the result as a check, and then both stations give the "end of work" signal. A charge of 5*s*. is made for each bearing. France has about 12 of these stations, the United States have nearly 50, Canada and Newfoundland have 4 in the Gulf of St. Lawrence and the Atlantic, Sweden has 2, and Norway has 5 in the course of erection.

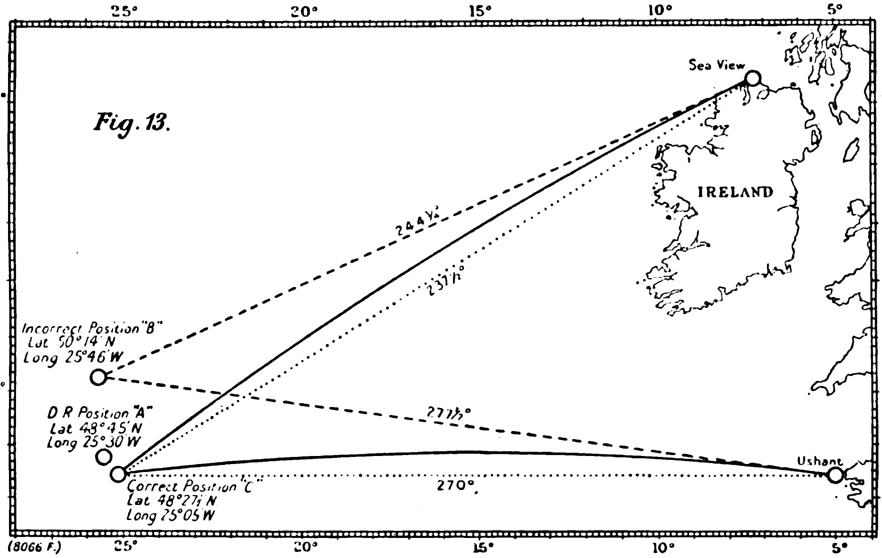


Fig. 13.

In Fig. 13, which is taken from the Admiralty List of Wireless Stations, an imaginary example of long-range position finding is used to show the corrections necessary when Mercator charts are used. The great-circle bearings measured at Ushant and at the imaginary station of Sea View are supposed to be telegraphed to the ship as 277½ degrees and 244¾ degrees, respectively, the angles being reckoned from true north in the clockwise direction. An accurate plot of the great circles is shown by the full-line curves, which start from the direction-finding stations in the true directions. If instead of the accurate curves the broken straight lines be drawn, starting from the direction-finding stations at the same true angles, the erroneous result shown in the figure is obtained. But the navigator may obtain a sufficiently approximate result by the use of straight lines if these lines start from the direction-finding stations at suitably falsified angles, as shown by the dotted lines. The necessary falsification in the case of each line is equal to half the respective "convergency"—that is, to half the difference of the angles at which the great circle cuts the meridian at the direction-finding station, and at the ship. This convergency is easily got from the traverse table, or otherwise, if the position of the ship has first been estimated by, say, dead reckoning. In the cases shown in Fig. 13 the falsification needed is 14 degrees in one case, and 15 degrees in the other.

THE GERMAN METHOD IN THE WAR.

The third or radio-phare method was used by Germany during the war at two places on the North Sea front for naval purposes, and at several other places for guiding aircraft. The apparatus was similar to that briefly described on p. 147, but it appears that in some instances the sending aerial was an upright coil which rotated continuously while sending dots at short intervals of time. Each operator on a distant vessel or Zeppelin was provided with a stop-watch of which the hand rotated, at the same rate as the sending aerial, over a dial marked with the points of the compass. At the beginning of each revolution, when the coil was in the north-south line, a special signal was transmitted and the operator started his stop-watch. He then listened until the signals continuously emitted from the coil seemed strongest and stopped the watch. At that instant the coil transmitting must have been pointing directly to the observer, who therefore read his bearing directly from the dial. In a few minutes several trials could be made and the bearing found with less than 3 degrees of error. Apart from these war uses, the radio-phare method has not had wide application in ship navigation: the Inchkeith experiment, already described, is the most modern form and may prove itself worthy of widespread adoption.

AIRCRAFT AND DIRECTIONAL WIRELESS.

For the purposes of navigating aircraft, a directive transmission method has been described by two officers of the Royal Air Force (Erskine Murray and Robinson). Two directive transmitting aerials, say upright coils several feet high, are mounted with planes at right angles so as to be movable round the same vertical axle at a constant speed of one revolution per minute. These coils are connected in series and the connections of one of them can be reversed four or more times per second by an automatic switch. When the apparatus is supplied with spark energy, a distant receiver of ordinary type will, in general, receive signals which are alternately loud and soft as the switch moves to and fro, but when either of the coils is pointing to the distant receiver the reversal of the other, which is broadside on to the receiver, has no effect, and therefore the alternations of strength disappear. As in other cases, a special signal is automatically sent by the apparatus when the rotating aerial passes through a standard azimuth, and a bearing is obtained by the aid of a stop-watch.

Besides the above three principal methods there are others of less general application. For instance, the Germans have recently experimented with a method employing two directive transmitting aerials erected at the same place with a small angle between their planes, one aerial transmitting A and the other N. Then if a ship or aeroplane fitted with ordinary receiving apparatus moves along a course perpendicular to the A aerial, it can hear only the N signals. On the other hand, if it moves perpendicular to the N aerial it can hear only A. Therefore, by steering so as to keep both A and N audible, the navigator can be sure of holding a nearly straight course lying between the two perpendiculars. The experiments showed that at 6 kilometres distance the course was only 16 metres wide. The method might be very useful on a straight fairway.

SPECIAL DIFFICULTIES OF AIRCRAFT.

It will be understood that, in general, nearly all the methods and apparatus employed in the navigation of ships have been applied to the navigation of aircraft. But certain special difficulties arise both in rigid airships and in aeroplanes. The chief difficulty is that the apparatus must be very light and compact. In the cramped space of a 'plane, again, the sparking-plugs of the engines create electric waves that drown the signals unless special precautions are taken. With regard to this point, it is found that in large 'planes, the interference by the sparks can be nearly eliminated by shielding all the tuning and detecting apparatus and by covering all the magneto wiring with metal. The trouble arising from the noise of the engines is more difficult to remove, as sound succeeds in penetrating the most elaborate helmets and pads; and therefore when D.F. apparatus is installed in a 'plane it is not easy to employ the method of zero sound which is so suitable for a quiet ground station.

In consequence of these difficulties, the Air Ministry have fitted a number of the larger 'planes with a modified frame-aerial apparatus developed by Captain J. Robinson. The modification consists in fixing perpendicularly to the usual rotatable coil, a smaller coil which can be connected either in series or opposition by turning a switch by hand. In use, the large coil is rotated until the signals are strongest and then the switch is moved to and fro and the coil finally adjusted until the signals are equally strong in each position of the switch. This shows that the small coil is broadside on and that the large coil is pointing accurately to the distant transmitting station. This modification of the single-coil method is claimed to give the accuracy of the zero-sound method although the signals themselves are heard at full strength.

Besides the frame-aerial method and its modifications, the radiogoniometer has also been used in large 'planes. In this case the two crossed directive aerials are each large coils of one or more turns, one coil being wound the long way round the wings and the other lengthwise round the fuselage. Leads from the coils are carried into the cabin to the internal coils and wireless apparatus. As the search coil is only a few inches long, whereas the frame aerials used in the method of the preceding paragraph ought to be four or more feet high, it is possible to use the radio-goniometer in a smaller 'plane than will admit of a frame aerial. In both cases the errors caused by the metal parts of the 'plane make it necessary to calibrate the apparatus in each quadrant before it takes the air.

When a 'plane is too small to be equipped with a rotatable frame aerial or a radio-goniometer, it may be fitted with one or two coils fixed on the wings or the fuselage, and bearings may then be taken with ordinary wireless apparatus by turning the 'plane off its course. For example, if a fore and aft coil be fixed on the 'plane and connected to ordinary receiving apparatus, the 'plane may be turned until the signals from a distant beacon, or any commercial station, are loudest. In this position the 'plane is heading towards the distant station and a compass reading will give the bearing. If a similar observation be made by heading the 'plane for another station the cross bearing will give the approximate position of the 'plane. This simple method has been used for heading night bombers for home, a continuously operating beacon being installed near the aerodrome for the purpose.

POSSIBILITY OF ERROR.

In all the wireless methods of finding bearings which have yet been invented, there are possibilities of certain serious errors. These are mainly of two kinds, some arising from topographical, and possibly geological, features near the directive station and others produced by variable atmospheric conditions. The former kind of error may sometimes be evaded by removal of the station to another site, or may be allowed for by experience or experiment, but errors due to atmospheric changes are, at present, beyond explanation and correction.

The atmospheric vagaries are usually greatest about sunrise or sunset and persist in varying intensity throughout the night; they are usually of negligible influence in the daytime. The rays of the sun appear to keep the air uniformly ionised and conducting during the day, but at sunset and afterwards the conductivity tends to disappear and certain reflecting layers above the highest cloud levels appear to become exposed in such a way as to constitute an uneven electrical ceiling. But whatever the explanation may be, the result is that the waves may follow curved paths from the sending station to the directive station, and the frame ærial at the latter may yield the strongest signals when pointing several degrees away from the true direction. Cases are on record in which a night bearing has been about 90 degrees in error. It follows that cross bearings made on a bad night may be very misleading. An interesting example appears to have occurred during the war when a fleet of Zeppelins after raiding England strayed into France and met destruction. Doubtless the erroneous positions supplied by the wireless apparatus co-operated with an unusually high wind velocity in the high levels to bring about this result. The difficulty of making a dead reckoning in the case of aircraft calls for great caution in the use of night wireless.

INFLUENCE OF LOCAL CONDITIONS.

Errors due to local conditions usually arise from the presence near a directive station of hills, trees, buildings, masses of metal and the like. Researches are being made into these matters by the Radio Research Board, which promise to give valuable guidance in the selection of future sites, and in correcting for the errors of ill-placed stations. Another error of topographical type arises when the waves have to pass along a coast-line or across irregular patches of land and water on their way to the receiver; for the difference of the velocities of the waves in land and in water cause deflections. Under the head of errors due to local conditions we may put those due to fog and to cloud. These are never great except when the fog is very patchy; in a uniform fog there is no error.

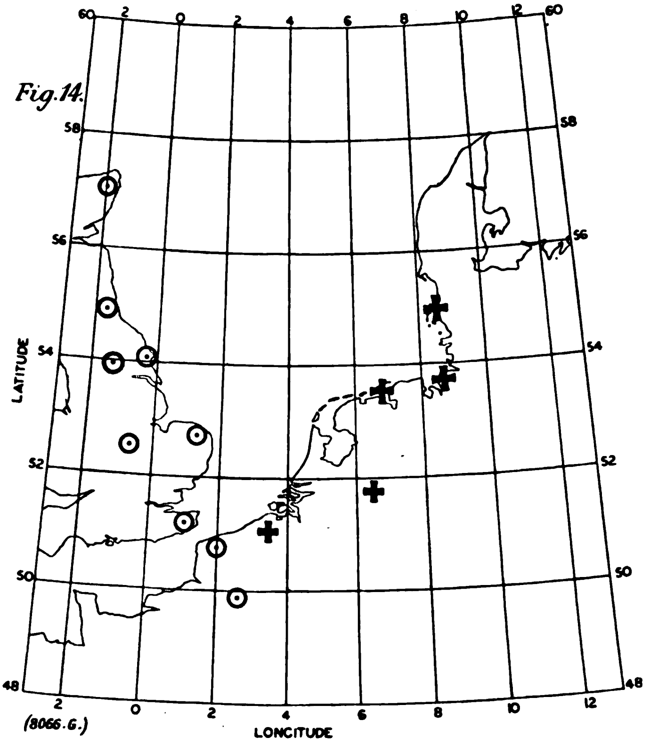


Fig. 14.

(8066.G.)

It is clear that such errors as these cannot be detected immediately if bearings are taken of only two stations, although two is the number theoretically necessary and sufficient for determining a position. Therefore, in equipping harbours with D.F. stations, or with beacons, or with radio-phares, it is advisable to provide at least three, and these should, if possible, be at the corners of a well-spread triangle. The importance of a good distribution of the D.F. stations was frequently brought out during the war, and is well shown by the map reproduced in Fig. 14, on page 153, from the *Journal of the Institution of Electrical Engineers.* Here it is seen that the German stations are badly placed for the control of Zeppelins or aeroplanes raiding London or the British lines in France, though they are well placed for fleet operations in the North Sea. The efficacy of the distribution of the British stations in a long line was demonstrated on the eve of the Battle of Jutland. Two batches of instructions were transmitted from the German flagship at an interval of several hours, and on each occasion bearings were taken from several of the British stations. From these it was deduced that the flagship had moved about seven miles down the Elbe. The angular measurement was only one and a half degrees of arc. This was regarded by Sir Henry Jackson, the First Sea Lord, as sufficient justification for clearing the North Sea and ordering the Grand Fleet to sail. His confidence was probably based upon his experience with the long base line of the British stations, and was justified by the event.

COMPETING SYSTEMS OF DIRECTIONAL WIRELESS.

There has been much discussion of the relative merits of the principal systems of wireless navigation. The main questions asked are: Is it better to use directive transmitters, that is to say radio-phares, or to use directive receivers? And, in the latter case, is it better to place the directive receiving apparatus at the fixed points of reference or to carry it on the craft which seeks to know its position?

In comparing the radio-phare method with the method of directive reception from beacons or ships, it is generally thought that directive reception is more accurate than directive transmission for instrumental reasons and also because the night vagaries are usually worse in the transmission method. As regards capital outlay, the radio-phare costs more than its rival, but since it is automatic in action its operating costs are smaller. In channels or entrances thronged with vessels carrying ordinary receiving apparatus or in controlling air fleets without landmarks, the radio-phare has the great advantage that it may be utilised simultaneously by all. In war it is superior to the fixed D.F. system because the craft utilising its services need not make any signals which, if made, would disclose its position to the enemy.

As regards the second question, the fixed D.F. method as compared with the moving D.F. method has the advantage that it can usually be given more favourable surroundings. The moving apparatus has often to be used amid the noises of wind and water, of engines, and near the magneto circuits of aeroplanes. In addition, the moving apparatus partakes of the pitching and rolling motion of its vessel and, in the case of aeroplanes, the necessary compass observations are less accurate than those made on land. On the other hand, a difficulty arises with aeroplanes carrying trailing transmitting aerials. The obliquity of the trailing wire, in general, falsifies the angle at which a distant frame aerial must be set to receive the strongest (or weakest) signals. In fact, the angle is accurate only when the aeroplane is heading directly towards or away from the D.F. station. Another argument for the adoption of the moving D.F. system for war 'planes is that it can take cross bearings on beacons or other fixed stations without betraying its presence to the enemy.

A Matter of Economy.

An economic comparison of the contrasted systems in the case of ships is difficult, because when the D.F. stations are on shore they are usually State-owned and operated and the ships make no modification in their apparatus or personnel. The shipowner naturally favours this arrangement. He can plead that it is more reasonable that a Government should provide a small number of D.F. stations for all shipping than that the shipowners should provide a D.F. set on each ship; besides which the shore stations are needed for the various navies. These arguments have possibly influenced international action, for many countries have installed State-owned shore stations for making D.F. observations upon request.

On the other hand, if wireless navigation should come into universal use, the provision of shore D.F. stations may fail to meet the needs of merchant shipping in congested waters, for under this system of operation each ship must take its turn and may thereby be delayed. Circumstances of this kind may ultimately compel the adoption of the system in which the ship carries its own D.F. apparatus and takes its own bearings from beacons; or, alternatively, may compel the adoption of the method of taking bearings by aid of radio-phares.

W. H. Eccles.

CHAPTER VIII.

ELECTRIC PROPULSION OF SHIPS AND ELECTRICAL AUXILIARY MACHINERY.

IN reviewing the various methods of ship propulsion it is at once apparent that electric propulsion has not made any very strong adherents among shipowners and builders in this country. It is difficult to give any single reason for this state of affairs, but undoubtedly amongst the contributing factors are the extravagant claims which have been made from time to time for this form of propulsion. An examination of Table I., on pages 158 and 159, of electrically propelled ships being built and in commission, will at once betray the fact that the majority of such ships are American.

Of the ships built in this country, the San Benito, constructed for the United Fruit Company by Messrs. Workman, Clark and Co., Ltd., is in service, and has covered 8,000 miles without any expenditure on maintenance. There are also three other ships building in this country for the same owners, and equipped with the Diesel-electric drive. A line of electrically-propelled ships, owned by the United States Shipping Board and operated by the Barber Steamship Lines, now call regularly at ports of the United Kingdom. Probably the most notable vessel of this line is the Invincible, of which particulars are given in Table I. The Invincible has now completed 58,000 miles with practically no maintenance charges as far as the electrical gear is concerned.

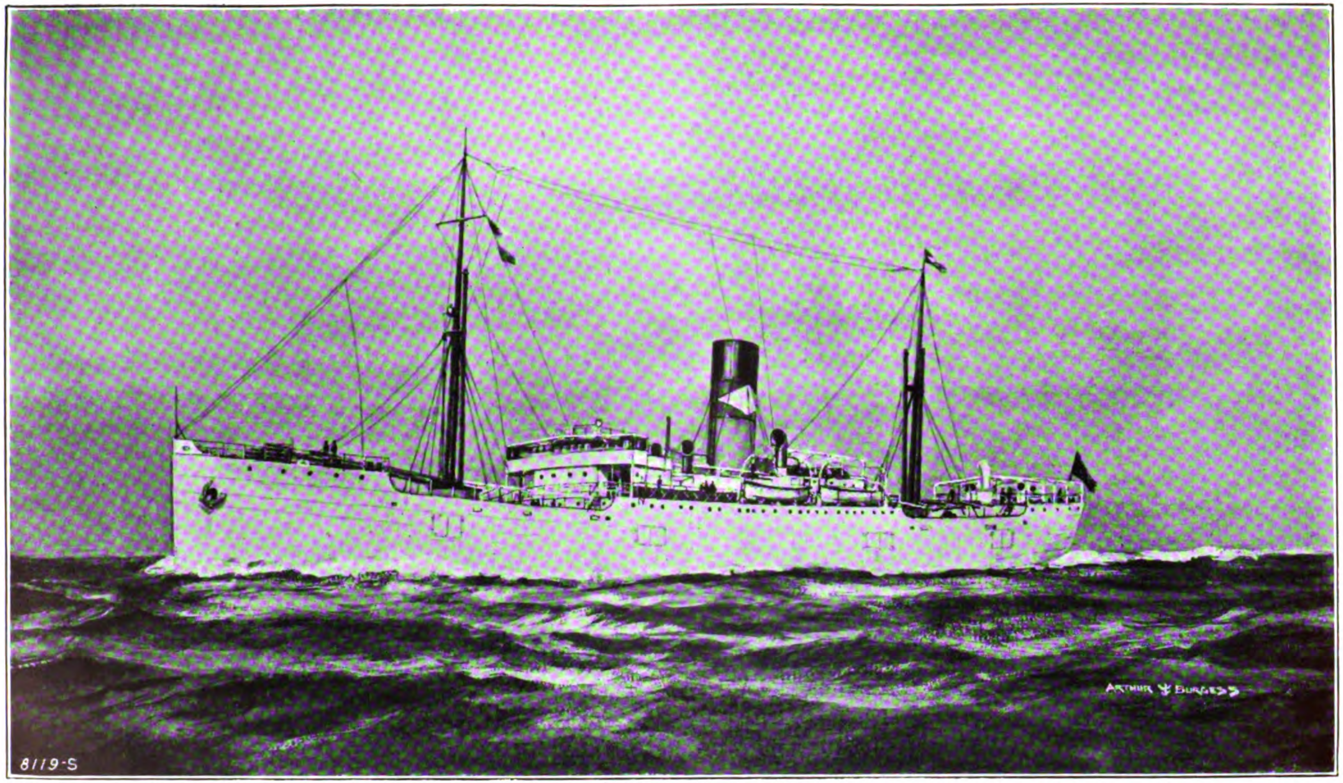
These examples are given to show that electric propulsion is well beyond the experimental stage, and that electrical manufacturers in this country have seized the opportunity of acquiring experience in the design of electrical machinery for ship propulsion.

ADVANTAGES AND DISADVANTAGES OF ELECTRIC DRIVE.

Electric drive is merely a form of gearing and is useful in the same way that gearing is useful, that is, to vary the rate of revolution of the prime mover irrespective of that of the propeller shaft. It follows from this that the electric drive is most useful (just as gearing is most useful) where the speed of the prime mover is high as compared with the propeller speed required to give maximum efficiency. In addition to the common function of acting as a reduction gear, the electric drive has several characteristics, which, in certain instances, are advantageous, and are not possessed by mechanical reduction gear.

These characteristics may be enumerated as follows :—

(1) The prime mover may be kept operating at its maximum or



(*From a drawing by Arthur J. W. Burgess.*)

DIESEL-ELECTRIC SHIP LA PLAYA, FOR THE UNITED FRUIT COMPANY, WITH CAMMELLAIRD-FULLAGAR ENGINES.

(*Constructed by Messrs. Cammell Laird & Co., Ltd., Birkenhead.*)
(*For particulars see pp.* 158 *and* 159.)

most economical speed while changes in the propeller speed can be obtained by changing the electrical gear ratio.

(2) The electrical gear is reversible and no reversing element is required in the prime mover, which can be kept operating in the same direction during the reversing operation.

(3) The propeller driving unit can be dissociated from the prime mover and put down in the most convenient position to obtain the desired result.

(4) The electrical drive is comparatively silent.

(5) The electrical gear has greater flexibility than the mechanical gear. That is to say, in ships equipped with more than one propeller and with two prime movers, one prime mover can drive all the propellers at correspondingly reduced speed without affecting the possibility of reversing one propeller relatively to the other.

(6) The electrical drive enables full power to be utilised for going astern.

The characteristics which count against electric drive are as follow:—

(1) The electrical drive, in general, weighs more than the corresponding geared-turbine drive. The high-speed Diesel-electric drive, as compared with the direct Diesel, however, will not in the main suffer from this defect.

(2) The electrical drive, generally speaking, is less, and at the best no more, efficient than the geared-turbine drive where uniform speeds are normally required. The electrical drive has considerable advantage in efficiency where it is required to cruise at slow speeds for any length of time.

(3) The electrical drive occupies more space than a geared-turbine drive.

THE DIESEL-ELECTRIC DRIVE.

The drawings on pages 160 and 161 illustrate a Diesel-electric drive for a cargo vessel. The direct-connected low-speed Diesel engine, of late, has done so well and is now being built in such large sizes that the flexibility obtained in assocation with the electric drive in applying the power of any number of small-power units to one or more propellers is no longer of any great value except on ships of above 3,500 S.H.P. On the other hand, the electric drive can still function as a speed-reducing element to enable the rate of revolution of the Diesel engine to be raised. Diesel engines have been made to operate at 450 r.p.m. for short periods, but, at this stage in their development, no maker would think of adopting such an engine speed for continuous operation. The highest rate that could be put forward safely would be 355 r.p.m. as a maximum. With this light type of engine it is possible to show an advantage in weight with the Diesel-electric drive. In addition to the reduced weight of the engine, when run at this speed, there is a further advantage obtained in the increased reliability arising from the use of small cylinders. This advantage would be offset if the engines were run too fast, but with the conservative figure of 355 r.p.m. this does not arise.

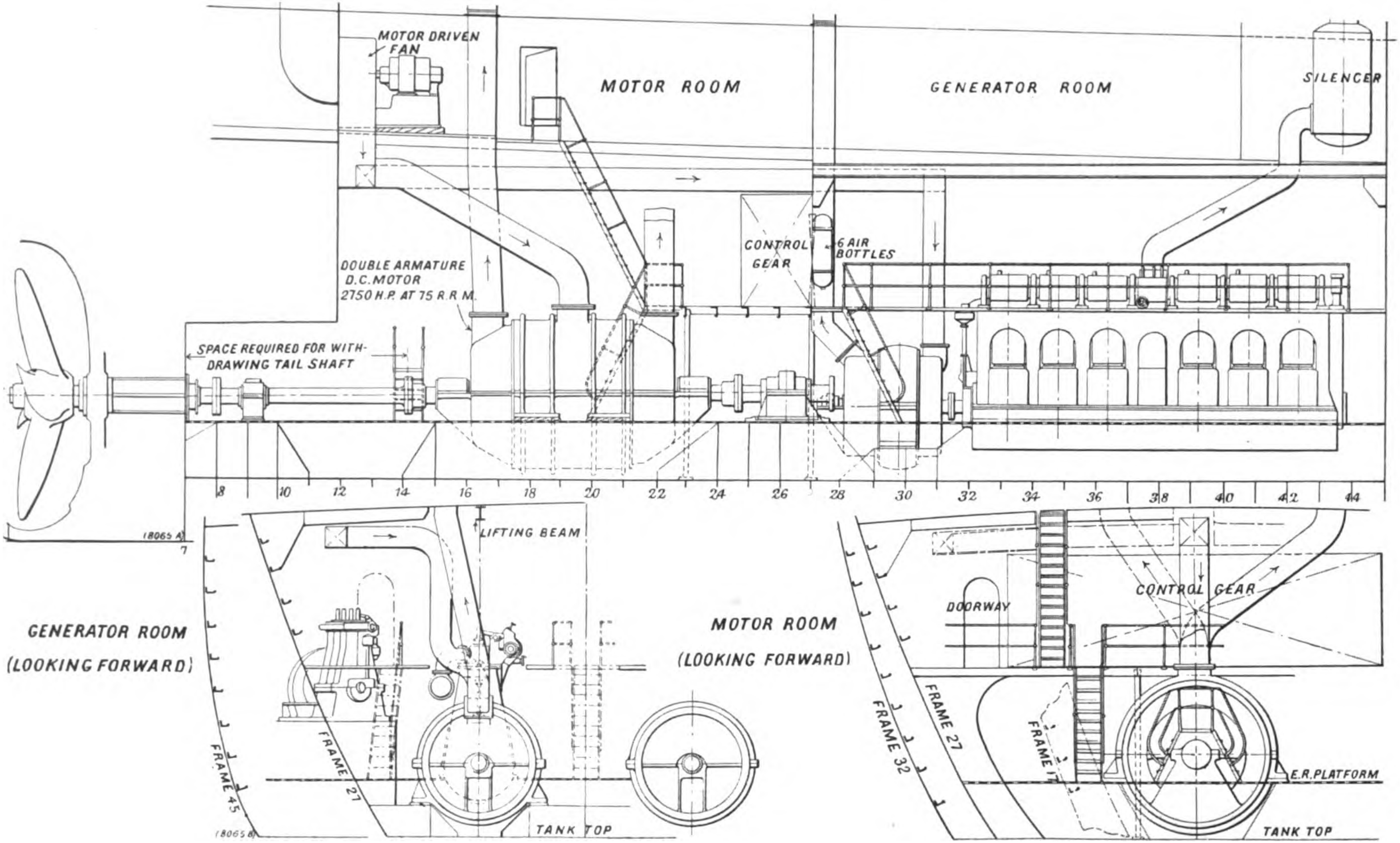
In the case of the comparatively slow-running Diesel engine,

TABLE I.—PARTICULARS OF ELECTRICALLY-PROPELLED SHIPS

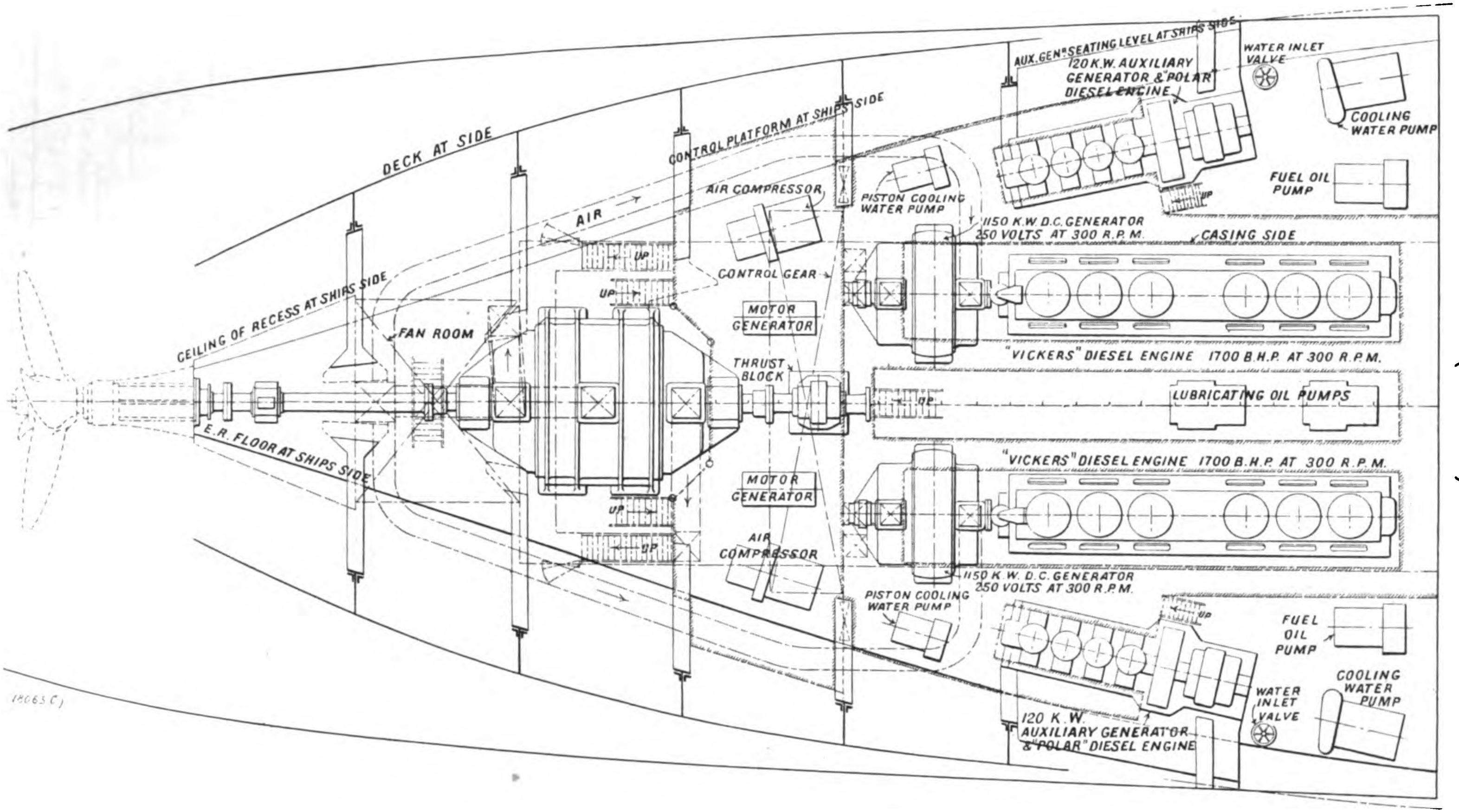
Name of Ship.	Type.	Builders of Machinery.	Date.	S.H.P.	Speed (knots).	Full-power Propeller Revolutions	Water-rate Propelling Machinery.	Steam Pressure.	Super-heat. Degs. Fahr.
Joseph Medill and Graeme Stewart	Chicago fire boats	—	1908	—	—	—	—	—	—
Electric Arc	Experimental launch	Mavor and Coulson	1911	25	8·3	400	—	6-cylinder petrol engine, 800 r.p.m.	—
Tynemount	Cargo	Mavor and Coulson	1912	500	9	80	—	6-cylinder Mirrlees Diesel engines, 400 r.p.m.	—
Langley	U S. aircraft carrier	General Electric Co.	1912	5,500	14	110	12	190	Nil
Mjölner	Cargo	Swedish Ljungström	1912	950	11·5	90	—	218	190
Wulsty Castle	Cargo	Brush Co.	1918	1,500	10·0	76	10·25	180	200
Maryland New Mexico California West Virginia Tennessee Colorado	U.S. Battleships	General Electric Co. and Westinghouse	1918-1923	Normal 28,000 Maximum 38,500	21	170/180	11·9/12 all purposes	250	50
Lexington and Saratoga	U.S aircraft carriers	General Electric Co. Westinghouse	1924	180,000	33·25	331	—	—	—
Aquila, etc.	Cargo	Swedish Ljungström	1918–19	1,200 I.H.P.	10·25	70	9·4 all purposes	220	240
Eclipse	Cargo	General Electric Co.	1919	3,000	—	100	—	210	200
Cuba	Passenger	General Electric Co.	1920	3,000	17·28	100	—	190	200
Mariner	American trawler	New London S. & E. Co.	1920	400	10·5	200	—	2 8-cyl. 4-cycle Diesel engines, 240 B.H.P. each, 350 r p.m,	—
Elfay	American yacht.	Winton-Westinghouse	1920	90	8·5	350	—	1 115-B.H P. 6-cyl. Winton Diesel engine, 425 r.p.m.	—
Guinevere	American yacht.	Winton-Westinghouse	1921	550	11·5	220	—	—	—
Invincible—11,868 tons	Cargo	General Electric Co.	1921	2,860	11	100	—	195	160
Fordonian	Cargo	General Electric Co.	1921	850	—	120	—	2-cycle Diesel engines	—
San Benito	Cargo, United Fruit Co.	British Thomson Houston Co. and Workman, Clark	1922	2,500	12·5	100	--	200	200
Kamoi—20,000 tons	Japanese Navy fuel ship	New York Shipbuilding Co. General Electric Co., U.S.A.	1922	8,000	15	120	9 all purposes	250	150
Guaruja—8000 tons 5130 tons D.W.	Passenger and cargo	Establissements Sauter-Harle, France	1923	2,700	13/10	123	—	Turbo-alternators	—
Independence, U.S.A.	Cargo	—	1923	—	—	—	—	Turbo-alternators	—
La Playa	Cargo. United Fruit Co., U.S.A. Diesel/Elec.	Cammell Laird. Fullagar and British Thomson-Houston Co.	1923	2,500	14	90	—	Fullagar engines, opposed pistons	—
—	Do.	Do.	1923	2,500	14	90	—	Do.	—
—	Do.	Do.	1923	2,500	14	90	—	Do.	—
Standard Service	Diesel/Elect. Tanker, Standard Oil Co.	General Electric Co., U.S.A.	1923	600	9	130	—	2-400-B.H.P. 5-cyl. 4-cycle Werkspoor Diesel engines	—
—	Passenger-cargo, 210′ lg, 40′ bm.	Staten Island Shipbldg. Co.	1922	—	—	—	—	—	—
Golden Gate Golden West W. R. Hearst Rodman Wanamaker G. W. Loft	Turbo-electric ferry boats.	Staten Island Shipbldg. Co.	1923	—	—	—	—	—	—
—	Diesel/electric barge	Newport News Dry Dock Co. Westinghouse	1923	455	9	100	—	2 300-H.P. McIntosh & Seymour Diesel engines	—
—	Four dredgers, U.S. War Dept.	Westinghouse.	1923	1,600	—	90/100	—	—	—
Twin Cities Twin Ports	Cargo	Gt. Lake Eng. Wks., Detroit, for McDougal Terminal Warehouse Co.	1923	—	—	—	—	6-cyl. Lombard Diesel	—

TABLE I.—PARTICULARS OF ELECTRICALLY-PROPELLED SHIPS—*continued.*

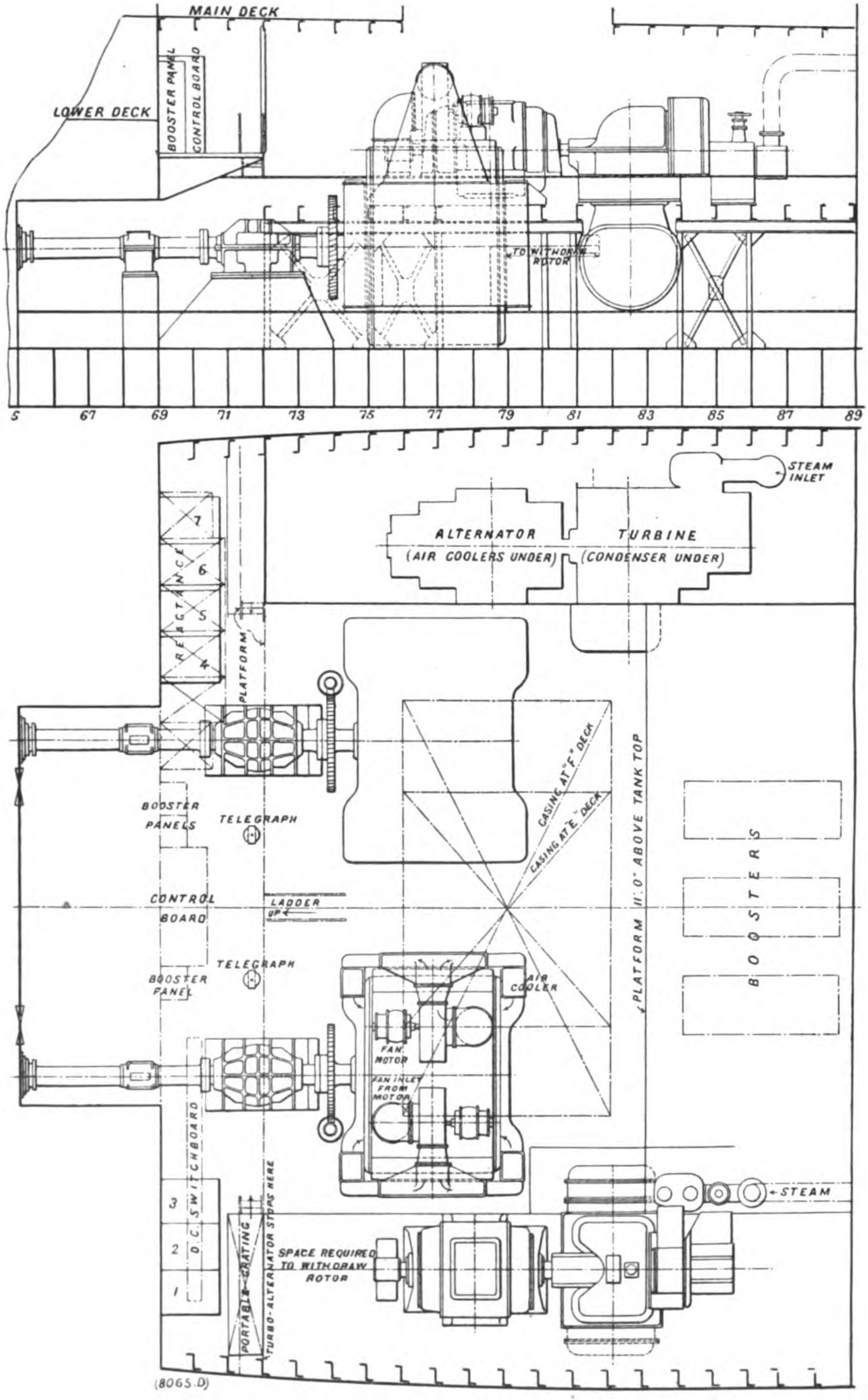
Number of Generators and Type.	Number of Motors and Type.	Voltage and Periodicity	Fuel Consumption.	Current to Auxiliary Machinery.	No. of shafts	Weight of Propelling Machinery. (Tons.)	Remarks.
2 D.C.	2 D.C.	—	—	D.C.	2	—	—
1 3-phase double wound	1 3-phase 4 and 6 poles	20 and 30	—	—	1	—	Double windings on generator to give frequency of 20 and 30 periods.
2 3-phase 235 kw.	1 3-phase 30 and 40-pole	500 20 and 26·6	—	Steam	1	—	Double windings on motor, generators wound for different frequencies.
1 3-phase bipolar	2 3-6-pole direct-coupled	2,200	—	Steam	2	156	—
2 3-phase 400 kw.	2 induction-geared	500 120	—	A.C., 500 V.	1	55	—
2 3-phase, 625 kw.	2 induction-geared	650 60	Coal 1·05	A.C., 650 V.	1	179	—
2-phase and 3-phase	Squirrel-cage and wound-rotor 4 24 and 36-pole windings, direct-coupled	4,242 and 3,000	Oil 0·98 f.p. 1·07 at 17 knots	D.C., 240 V.	4	590	Westinghouse impulse and reaction turbines. Change-over speed 1,500 r.p.m. from 24 to 36-pole. 15 knots, 2,270 r.p.m., 36 poles. 10–15 knots, 1 generator, 36 poles. 15–17 knots, 1 generator, 24 poles. 17–21 knots, both generators, each supplying on 2 motors, P. and S. independent, 123 r.p.m. Propellers = 15 knots. Reversal 7 to 9 secs.
4 3-phase 40,000 K.V.A., 1,835 r.p.m.	8; 2 per shaft 23,000 S.H.P. 22 poles	5,000	—	Electric, D.C.	4	Electric 1,800, Total 6,172	16 boilers, 198,000 sq. ft. H.S., 18,000 sq. ft. superheater. Motors 6,800 S.H.P. each, 170 revs. per minute, 24 poles.
2-Ljungström, 5,400 r.p.m.	2 3-phase geared	450 90	Coal 1·08	A.C., 450	1	—	—
1 3-phase bipolar, 2,300 kw. 3,000 r.p.m.	1 3-phase 60-pole, direct coupled	2,300 50	—	Steam	1	—	1 Curtis turbo-generator, 3,000 r.p.m. Motor, slip-ring type. 2 35 kw. exciters, 125 V.
1 3-phase 2,350 kw. 3,000 r.p.m.	1 3-phase direct-coupled	1,100 50	—	D.C., 250 V., and steam	1	—	1 Curtis turbo-generator, 3,000 r.p.m. 2 auxiliary generators, 150 kw., 250 V.
D.C. 165 kw. 125 V.	1 direct-coupled 400 B.H.P.	125	30 gall. per hour	D.C.	1	—	—
D.C. 75 kw., Westinghouse, 125 V.	1 direct-coupled	125	7½ gall. per hour	D.C., 125 V.	1	—	—
—	—	—	—	—	—	—	—
1 A.C., 3,000 r.p.m., 2 360-kw.	1 direct-coupled 3,000 H.P.	2,300 50	—	—	1	—	—
D.C. 250 V., 2 240-kw.	1 direct-coupled	250	—	—	1	—	—
1 A.C., 3,000 r.p.m., 2,040 kw. 3-phase	1 3-phase, 60-pole, 2,500 H.P. synchronous	1,100 50	—	110 V., D.C.	1	—	B.T.H. Curtis turbo-alternator. 1,100 V. Electrical gear by B.T.H. Co. Mainly steam-driven auxiliaries.
1 2-pole, 3-phase generator, 6,250 kw., 2,300 V.	2 4,000-H.P. 40-pole, 230 V. 3-phase	2,300 40 230	Coal 1·29 lb. per S.H.P. hour, all purposes	225 112·5 } V.D.C.	2	231	1 main turbine, 10-stage, 2,400 r.p.m., driving one main generator, 2-pole, 6,250 kw., 2,300 V., 3-phase. 2 400-kw. D.C. turbo-generators, geared 5,000/1,100 r.p.m. for lighting, exciter and power, 3-wire, 225/112·5 volts.
2 1,000-kw., 3,000 r.p.m., D. reduction	2	—	—	—	2	—	Oil-burning ships. First French vessels arranged for turbo-electric propulsion.
—	—	—	—	—	—	—	—
4 500-kw., 250 r.p.m., 220-V. D.C. in series	1 2,500-H.P., 880-V., D.C.	880 D.C.	—	220 V., D.C.	1	—	4 Fullagar engines, each driving 1 500-kw. 220-V. D.C. generator, all in series, supplying 1-2,500-H.P. 880-V. motor.
Do.	Do.	Do.	—	220 V., D.C.	1	—	Do.
Do.	Do.	Do.	—	220 V., D.C.	1	—	Do.
2 245-kw., 220 V., D C.	2 300-B.H.P., 230-V., D.C.	230 D.C.	—	230 V., D.C.	1	—	2 400-B.H.P. Diesel engines driving 2 245-kw. generators, supplying 2 300-B.H.P. motors on a common shaft. 30-kw. exciter coupled to each generator.
Turbo generator, 650 kw.	2 induction, 2,300 V.	2,300 V,	—	—	—	—	—
Turbo generator, 650 kw.	2 Induction, 2300 V.	2,300 V.	—	—	—	—	—
2 185-kw., 275 r.p.m. D.C.	1-455-B.H.P. D.C.	D.C.	—	—	1	—	First Diesel electric barge for Standard Oil Co., N.Y.
3 700-kw., and 2 150-kw., Diesel-driven	2-Double armature, 800 H.P.	D.C.	—	D.C.	2	—	Diesel-electric hopper dredgers, 268 ft. 5 ins. long, 46 ft. beam, 2,000 tons D.W. carrying capacity.
2 D.C. generators	2 D.C. Motors	—	—	—	2	—	Ships, 1,700 tons deadweight. Length 258 ft., beam 42 ft., depth 19 ft. Electricity all purposes; bridge control.



Arrangement of Diesel-Electric Machinery for Cargo Vessel.

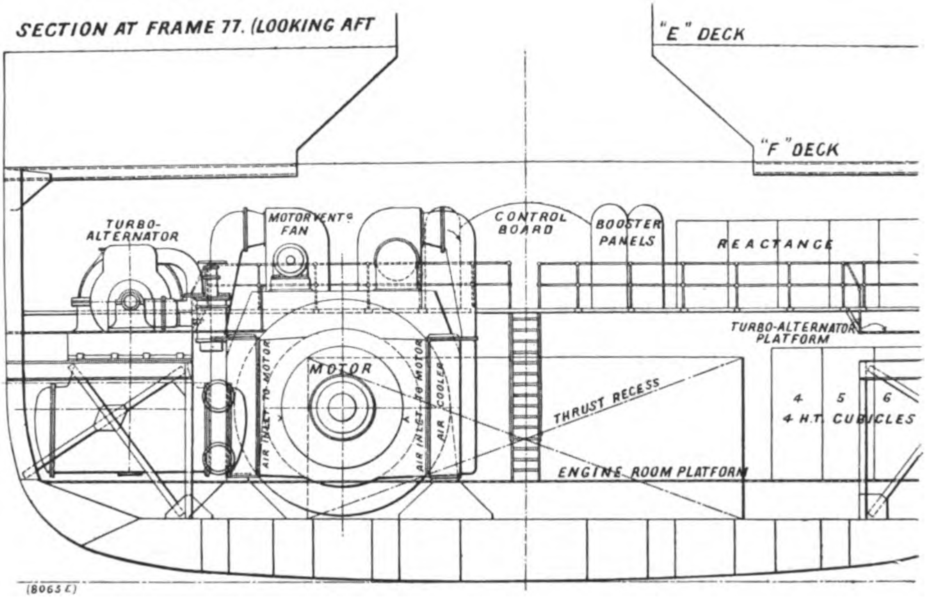

DECK AT SIDE
CONTROL PLATFORM AT SHIPS SIDE
AUX. GENR SEATING LEVEL AT SHIPS SIDE
120 K.W. AUXILIARY GENERATOR & "POLAR" DIESEL ENGINE
WATER INLET VALVE
COOLING WATER PUMP
FUEL OIL PUMP
AIR COMPRESSOR
PISTON COOLING WATER PUMP
1150 K.W. D.C. GENERATOR 250 VOLTS AT 300 R.P.M.
CASING SIDE
AIR
UP
CONTROL GEAR
MOTOR GENERATOR
CEILING OF RECESS AT SHIPS SIDE
FAN ROOM
THRUST BLOCK
"VICKERS" DIESEL ENGINE 1700 B.H.P. AT 300 R.P.M.
LUBRICATING OIL PUMPS
E.R. FLOOR AT SHIPS SIDE
"VICKERS" DIESEL ENGINE 1700 B.H.P. AT 300 R.P.M.
MOTOR GENERATOR
AIR COMPRESSOR
1150 K.W. D.C. GENERATOR 250 VOLTS AT 300 R.P.M.
PISTON COOLING WATER PUMP
FUEL OIL PUMP
COOLING WATER PUMP
WATER INLET VALVE
120 K.W. AUXILIARY GENERATOR & "POLAR" DIESEL ENGINE
18065 C)

ARRANGEMENT OF DIESEL-ELECTRIC MACHINERY FOR CARGO VESSEL.



Turbo-Electric Machinery for Passenger Vessel.

of 260 to 355 r.p.m., the motors and generators are of the direct-current type. When there are a number of generating units and motors they are all connected in series in a ring main, the starboard and the port side, where more than one propeller is used, being kept separate when running normally. The propelling motors are, however inter-connected so that either propeller, or all propellers, can be fed from either the port or starboard bank of engines. The motors and generators are shunt wound and the engines are generally run at top speed continuously, speed variation and reversing being obtained by controlling the generator fields. There is no great advantage obtained by regulating the speed of the propeller motors by adjusting the fields of the generators beyond the simplification of control. It is quite obvious that the mechanical losses in the Diesel engine are greatest at top speed, and, by regulating the speed by adjusting the speed of the Diesel engines, these losses would be reduced with some slight probable reduction in fuel consumption during the periods when the ship is run at a reduced speed. There is no question, however, that, in the majority of cases, the saving would be so slight that it would be almost negligible. On the other hand, if it is necessary to run the ship for long periods at reduced speed, it is always possible to reduce the Diesel engine speed, keeping full field on the generators. There is no doubt that the ease of reversal by changing over the generator fields is of considerable advantage. By connecting the armatures of the motors and generators in series, the load is made to divide itself and will still do so even if the engines are each running at different speeds.



Turbo-Electric Machinery for Passenger Vessel.

With this type of drive, it is usually a comparatively simple matter to arrange one of the propelling units so that it can provide power for the auxiliaries when at sea; the auxiliary generator being then shut down. This gives a saving in power equivalent to the difference in efficiency between the auxiliary generator and one of the main propulsion generators, and this is, in general, quite considerable. Of course, when it is required to reverse or when manœuvring, the generator providing power to the auxiliaries must either be cut out of the propelling power main or the auxiliary power supply must be changed over to the auxiliary generator. With this type of drive the control of the ship is very simple. The arrangement is extremely flexible and lends itself to the exigencies of the drive.

THE TURBO-ELECTRIC DRIVE.

The turbo-electric drive is illustrated on pages 162 and 163, on which are given the lay-out of a set for a passenger vessel. In this case the conditions are entirely different to those met with in the Diesel-electric drive. Instead of the slow-speed prime mover we have the turbine, probably operating at 3,000 r.p.m., and instead of a number of comparatively small generating units, the tendency, with this type of prime mover, is to make the generating unit as large as possible. These conditions make the use of direct current impracticable, and alternating-current motors and generators are adopted for the turbo-electric drive.

In the case of two or more propellers, however, the same flexibility can be obtained as in the case of the Diesel drive. Speed control, when other than permanent speeds are required, is usually obtained by changing the turbine speed, although it is possible to vary the speed by means of suitable rheostats in the rotor circuit if induction motors are used for driving the propeller. The gear ratio, in the case of alternating-current motors and generators, is the ratio of the number of poles in the two machines. By altering the number of poles in the motor, different propeller speeds can be obtained. It is usually possible to obtain three definite propeller speeds, although only two are generally employed; that is, full speed and cruising speed. The changing of the number of poles in the motors is carried out by means of suitable switches operated from the control station.

The auxiliary motors, as in the case of the Diesel-electric drive, can be also fed from one of the main propulsion generators when at sea through a transformer, to bring the voltage down to a value suitable for the small auxiliary powers. This necessitates the use of motors of the alternating-current type for the engine-room auxiliaries. The saving in power, while at sea, is of the order of 2 to 3 per cent. of the total power of the ship. There are, however, difficulties in the way of such an arrangement as might arise in the event of losing the vacuum, but these difficulties are not insurmountable, and as the saving obtained is appreciable, careful consideration should be given to this arrangement.

THE QUESTION OF COMPARATIVE EFFICIENCIES.

The fuel consumption of practically all the electrically propelled ships of which the author has obtained data is disappointingly poor. This, however, is not due to the electrical machinery, the efficiency of which can be measured easily and accurately, and on which there should have been no misapprehension. At first sight one would expect the high-speed Diesel engine to have a higher mechanical efficiency than its low-speed brother; as a matter of fact, however, there is practically no difference in the fuel consumptions. For the Diesel-electric drive an engine of 2,600 B.H.P. operating at 355 r.p.m. is the largest that has so far been developed. For a unit of this size the electrical efficiency would be 89 per cent. overall for a reduction in speed down to 80 or 100 r.p.m. at the propeller. Therefore, for the same propeller speed and the same efficiency of the Diesel engines, the Diesel-electric drive is less efficient by the amount represented by the overall efficiency of the electric generators and motors. A point which must not be forgotten, however, is that the most efficient propeller speed can always be selected in the case of the Diesel-electric drive, the only limitation being the size of the propeller motor, and in the case of the direct-current motor used with the Diesel-electric drive there is not likely to be any difficulty in placing this in the room available. This feature, in some cases, may result in almost wiping out the difference in efficiency due to the electric reduction. In addition, it is generally possible to use one propeller and to do away with the resistance due to brackets and struts. This would of itself be sufficient to offset the disadvantage of using the electric drive where such a point arose.

When comparing the turbo-electric drive with the geared turbine it must be agreed that there is very little difference in the internal efficiency of the two turbines, and also that the maximum amount of superheat (200° F.) can be obtained in both cases. Certain differences occur in the mechanical design which slightly reduce the efficiency of the geared turbine having H.P. and L.P. casings. The type of turbine used for electric propulsion would only have one casing; therefore the geared turbine will have two spindle glands and two bearings more than the electric propulsion type. In addition there will be the loss in the interconnecting pipes between the H.P. and L.P. casing, and also in the reversing element of the geared turbine. Table II. given below shows the comparative efficiencies for the type of turbine manufactured by the Metropolitan-Vickers Company, with whom the author is associated.

TABLE II.—EFFICIENCIES OF GEARED-TURBINE AND ELECTRIC DRIVES.

S.H.P.	Efficiency of Marine Geared-Turbine, exclusive of Gears.	Efficiency of Turbine Elec. Drive, exclusive of Generator.	Efficiency of Mechanical Gear.	Efficiency of Electric Drive.	Overall Efficiency.	
					Geared Turbine.	Electric Drive.
	Per cent.	Per cent.				
2000	69·9	73·8	96·5	89·2	67·4	65·8
4000	73·0	74·6	96·5	90·4	70·4	67·5
6000	73·9	75·4	96·5	91·0	71·3	68·6

Steam conditions—200 lbs. sq. in. gauge.
200° F. superheat. 28·5″ vacuum.

These efficiencies cover all losses from the stop valve to condenser and include oil pumps, and governor gear on the electric drive.

Obviously the losses depend upon the design of turbine, and the figures given can only be taken as representing what can be obtained by the firm in question. It is perfectly clear that if care is not taken in keeping the losses down at the points indicated, very much greater differences can be obtained. Table III., on this page, gives typical efficiencies for the electric generator and motors for turbo-electric propulsion.

TABLE III.—EFFICIENCIES OF GENERATORS AND MOTORS.

S.H.P.	Efficiency of Generator, including excitation.	Efficiency of Synchronous Motor, including excitation.	Power required for Blower, etc., for cooling, and Switch Gear and Cable Loss.	Overall Efficiency.
	Per cent.	Per cent.	Per cent.	
2000	94·25	95·0	0·2	89·2
4000	94·75	95·5	0·2	90·4
6000	95·0	96·0	0·2	91·0

The figures given in the table are conservative, they can be safely guaranteed and include the usual manufacturing margins. They are for 2-pole generators operating at 3000 r.p.m. and unity power factor, feeding single-speed synchronous motors driving the propellers at 120 r.p.m. For induction motors, the efficiencies given will be slightly reduced.

VARIATIONS IN TORQUE AT THE PROPELLER SHAFT.

Considerable variations in torque occur at the propeller shaft when stopping, backing, or turning ship, and also as the propeller rises and falls in a heavy sea. Useful data on the subject of propeller characteristics under such conditions are contained in papers by Commander Robinson which appeared in the *Transactions of the American Society of Naval Engineers* for February 1916, and also August 1919. These notes are very complete, and very little can be added to them.

With regard to torque variations in heavy seas due to the dipping of the propeller, this is naturally a subject upon which very little accurate data can be obtained. There is no doubt, however, that very considerable torque variations do occur.

Dealing first with the question of stopping, backing, and turning ship and the demand made on the propelling machinery during this operation, Diagram I. on page 167 shows the torque-speed curves compiled from Commander Robinson's tests on the Delaware propeller. These curves indicate clearly the torque required in reversing a propeller. From the full-load torque and speed point, the rate of revolution of the propeller drops to approximately 70 per cent. of normal rate when current is switched off the motor; at this point the propeller is being driven by the ship. The motor is now reversed and reverse torque is applied to the propeller, and at approximately 30 per cent. of normal speed, the reverse torque required reaches practically full load. From this point until the propeller stops, the torque decreases, and with the propeller at rest, dragging through the water, the torque required to hold it stationary is only a fraction of full load. From this point onwards, the torque curve rises steeply until, at about 30 per cent. of normal speed in the opposite direction to that in which the ship is travelling, full load torque is again required. These torque curves have been very fully discussed in the technical press, and, beyond this brief description, it is not intended to spend any further time on them. They have been reproduced merely to make clear why it is so often contended that induction motors can only be used for high-speed ships, and why, in the case of turbo-electric propulsion, it is always necessary to slow the turbine down to approximately 25 to 30 per cent. of normal speed before making a quick reversal of the propeller.

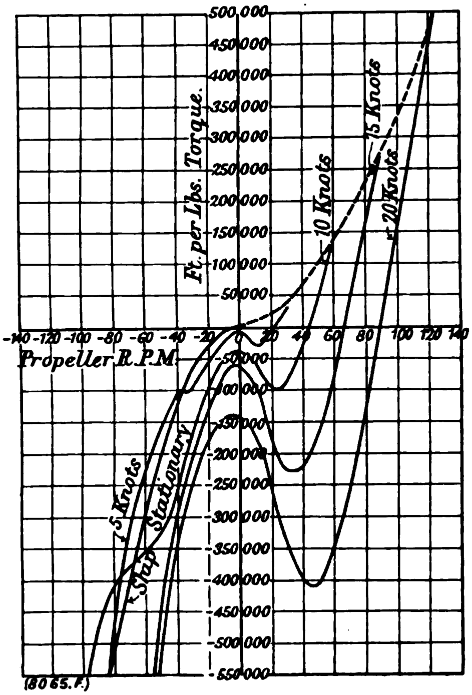


Diagram I.

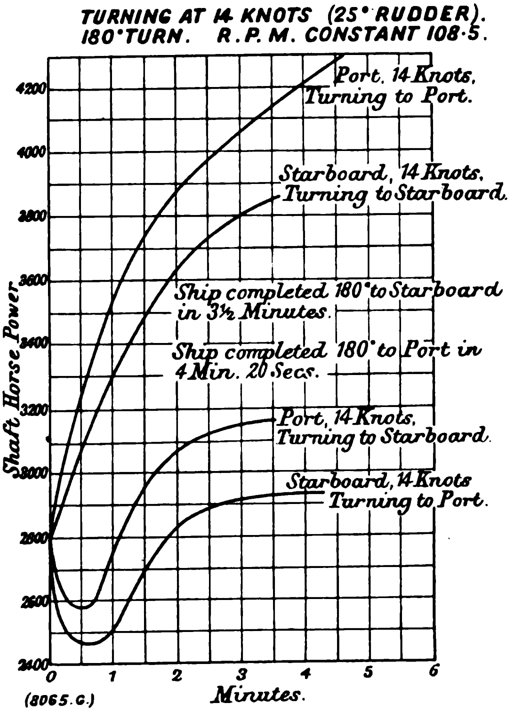


Diagram II.

In the case of the Diesel-electric system of propulsion, using direct-current generators and motors, it is not necessary to slow the engines, because voltage in this case can be applied gradually, and this corresponds, in the case of the direct-current scheme, to slowing down the Diesel-driven generators. Furthermore, in this case the propeller can be brought to rest by applying a small amount of field excitation to the motor with the field cut off the generator. The motor will then act as a generator and a very small field current will practically stop it, when the field excitation can be slowly applied to the generator in the reverse direction to bring the propeller up to speed as the ship loses way, stops, and begins to travel backwards.

As already explained, the torque-speed characteristics shown in the diagram have been drawn assuming that the ship does not lose way during reversal. This is only true, of course, in the case of heavy high-speed ships, and will depend upon the stored energy of the ship and the condition of the hull. Low-speed ships will almost instantly lose way as soon as power is cut off the motors. This will result in a considerable reduction in the amount of torque required at the 30 per cent. speed points, both with the propeller still running with the ship and also when the propeller is reversed.

APPROX. VOLT-AMPERE & K.W.-AMPERE CURVES
OF NORMALLY RATED ALTERNATOR CAPABLE OF 25 %
OVERLOAD FOR 2 HOURS.

100% SYNCHRONOUS IMPEDANCE AT FULL K.V.A.

Curves A.-Characteristics at ·8p.f. with excitation corresponding to full K.V.A. at ·8p.f. & normal voltage.
" B.- Characteristics at 1·0p.f. with excitation corresponding to full K.V.A. at ·8p.f. & normal voltage.
" C.- Characteristics at ·8p.f. with excitation corresponding to 150% full K.V.A. ·8p.f. & normal voltage.
" D.- Characteristics at 1·0p.f. with excitation corresponding to 150% full K.V.A. ·8p.f. & normal voltage.

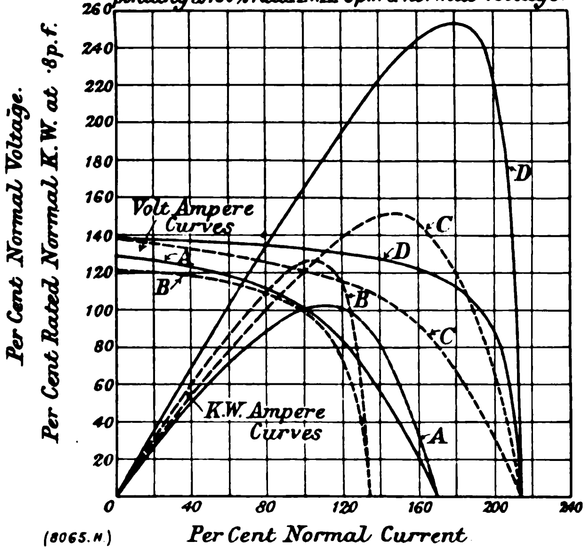
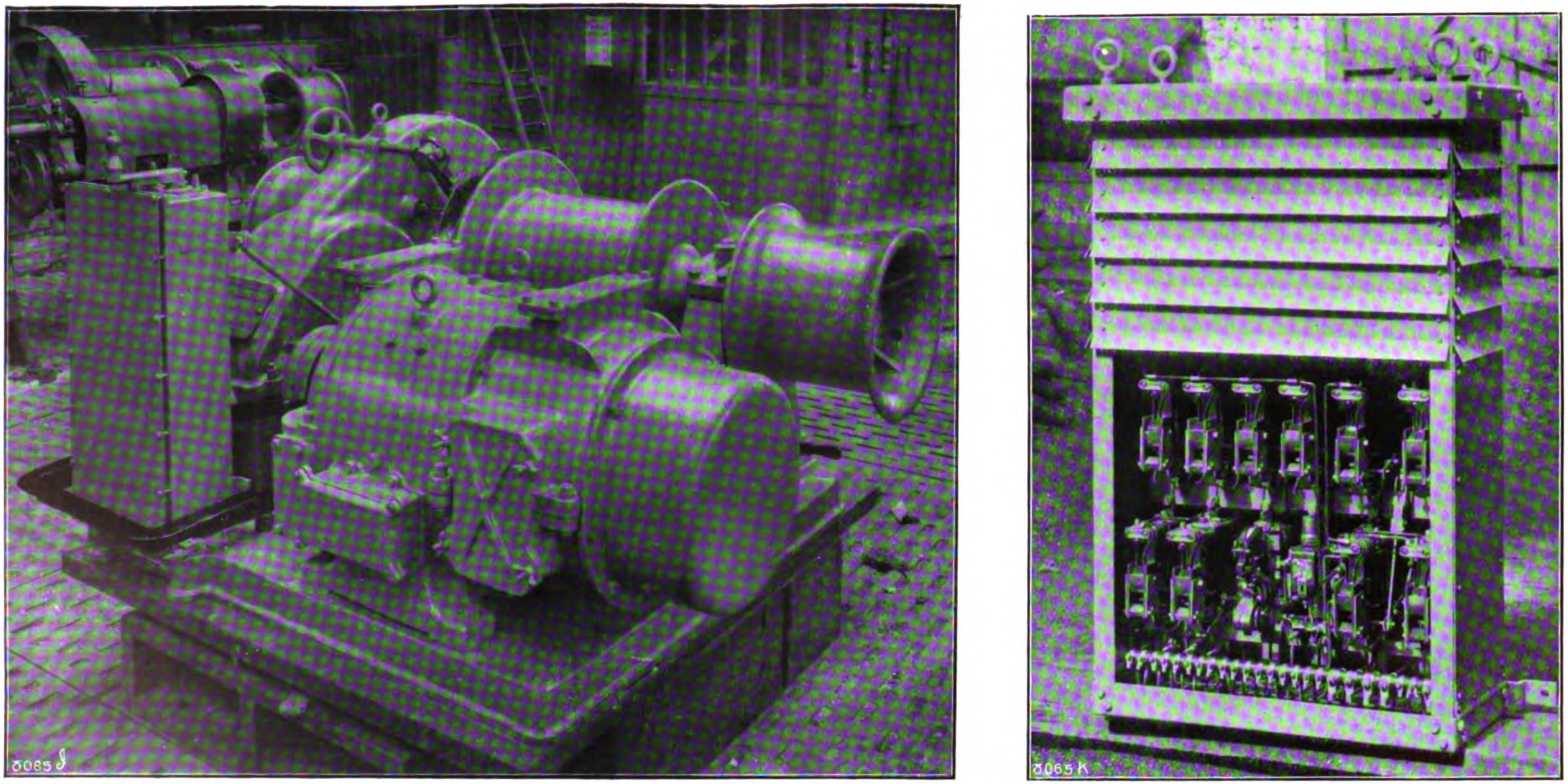


Diagram III.

With regard to the question of the power demand made on the propelling machinery in the case of multiple-screw ships when turning, this matter has also been very fully investigated by Commander Robinson. When turning ship at or near full speed, the power demanded by the inboard propeller rises very rapidly. Diagram II. on page 167 shows how the power rises in the case of the inboard propeller and falls in the case of the outboard propeller until, at



ELECTRICALLY-DRIVEN CARGO WINCH AND AUTOMATIC CONTACTOR PANEL FOR CONTROLLING WINCH.

(Electrical Equipment by the Metropolitan-Vickers Electrical Co., Ltd)

some point depending upon various conditions, it begins to rise again.

The last figure to be considered is the torque fluctuations in heavy seas, and as already explained, very little data are available on this subject. Each oscillation will, in this case, represent the passing of a wave; the periodicity of the fluctuations will depend upon various conditions such as the speed of the ship and the direction of the waves with regard to the ship's course. It has been stated that oscillations having peak values up to 2·5 times full load have been experienced.

THE DESIGN OF GENERATORS AND MOTORS.

All the foregoing phenomena have to be given the very fullest consideration in designing the generators and motors for electric propulsion. This is particularly the case where alternating-current generators and motors are concerned. The problem, however, resolves itself into a selection of a suitable combination of motor and generator which will give safe and reliable operation with the minimum weight and cost. A turbo-alternator will not stand much overload at normal excitation without losing its voltage. This would result in the breaking of the electrical coupling between the motor and alternator if it were not possible to increase the excitation and so increase the overload capacity. This is shown clearly in Diagram III. on page 168, and, in addition, the advantage to be obtained from the use of a synchronous motor operating at unity power factor is also indicated on these curves. It is therefore clear that for the same overload capacity it is possible to use a smaller alternator with a synchronous motor than with an induction motor. The synchronous motor, however, is limited in the amount of reversing torque that can be obtained, and, on this account, it has not been applied to high-speed ships having a large amount of stored energy. This difficulty, however, is not insurmountable, and having in view the advantage obtained on the alternator it is worthy of consideration. It is necessary, in order to get the maximum reversing torque with a synchronous motor, to get the turbine speed down to 20 to 25 per cent. of normal. Another objection to the synchronous motor lies in the fact that it utilises a squirrel-cage winding to obtain the starting and reversing torque, and if repeated manœuvres are carried out utilising this winding, the heating due to the dissipation of energy in the winding is likely to be objectionable. The synchronous motor is also a constant-speed machine, and it is not possible, except by a very special construction, to alter the pole numbers and so obtain cruising speeds. The ordinary induction motor does not suffer from these defects, but it necessitates, as previously pointed out, a slightly larger alternator and the overall efficiency will be lower. .

THE DRIVE OF AUXILIARY MACHINERY ON BOARD SHIP.

Mr. James Richardson, in last year's "Annual," made clear the position of electrically-driven auxiliaries on Diesel-driven ships as regards cost and efficiency. Briefly they are more expensive than steam-driven auxiliaries in first cost, but considerably cheaper to run, their running costs being in the neighbourhood of approximately one-sixth of that of steam-driven auxiliaries.

This figure is necessarily approximate and will vary with the conditions; for instance, it does not take into account the utilisation of the heat in the exhaust gases for raising steam for the engine-room auxiliaries during the voyage.

There is, however, very little doubt that the electric drive is the best in all-round efficiency, and, given proper consideration during installation, it has proved itself most reliable.

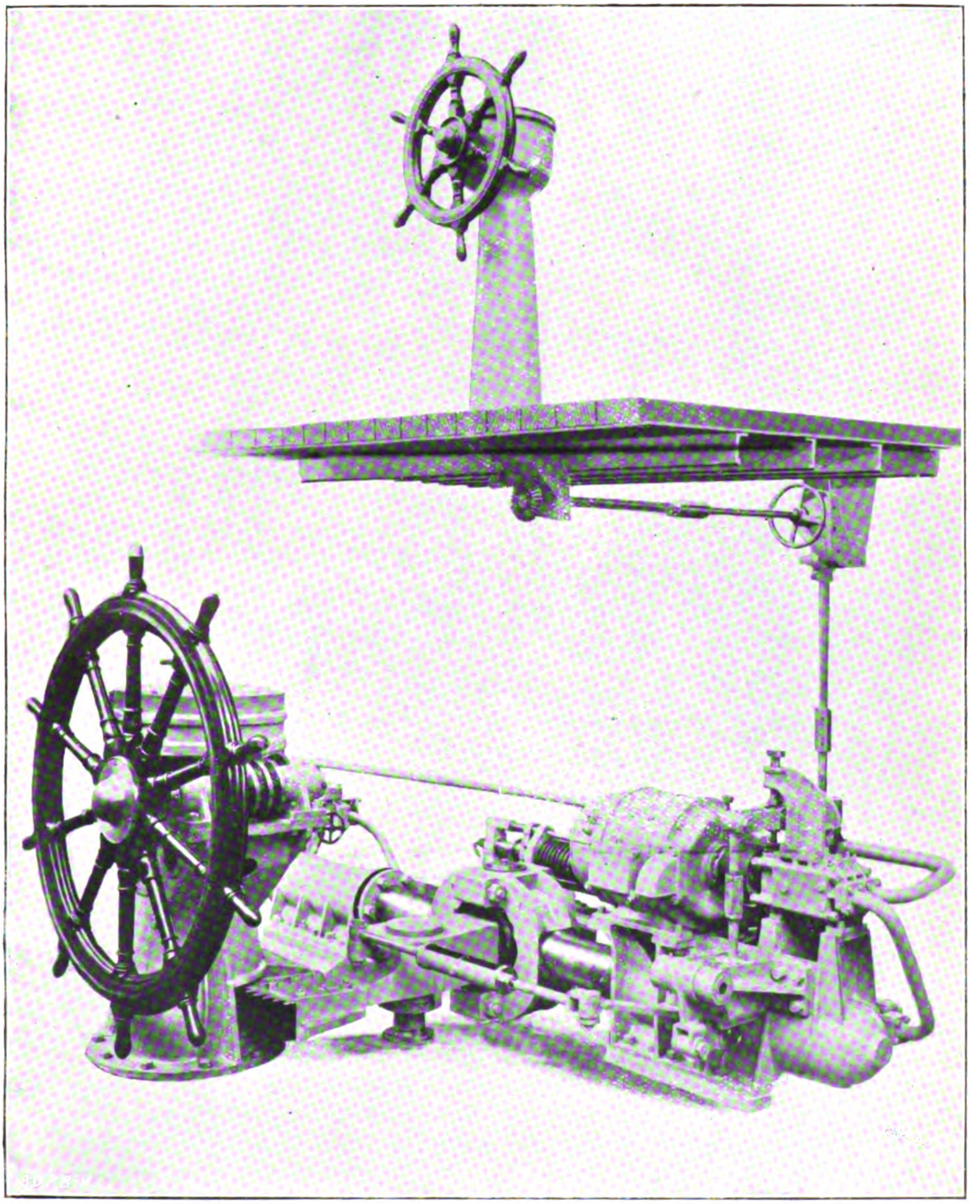
In the case of the geared-turbine ship, the conditions, of course, are different since steam is available and the comparison lies between the efficiency of a number of motors and a generator driven by a comparatively large turbine or engine and a number of inefficient steam engines.

Again, the exhaust steam from the majority of the engine-room auxiliaries can be utilised in the feed-water heater, so that up to a certain critical point when the amount of exhaust is too great to be fully utilised in the feed heater, the poor efficiency of the auxiliary engines has not a great influence on the total coal consumption. However, this critical point is very quickly reached in the case of the most efficient main propulsion units, and it is usually found that there is an excess of exhaust steam in these cases. It has been proved in practice that the critical point in feed heating is never passed in the case of the electric drive using a geared-turbo generator, the turbine exhausting either into the feed heater or into the later stages of the main unit as may best suit the conditions. Apart from this, however, there is the port load to consider, and here there is not the slightest doubt that the electric drive is the most reliable and efficient when proper consideration is given to the installation.

Choice of Alternating or Direct-Current Motors.

Most of the auxiliary drives on board ship can be regarded as constant-speed drives with the exception of the deck machinery. There are a few instances in the engine-room where a variable-speed motor is of some slight advantage; but it is not essential. Were it not for the deck machinery, alternating squirrel-cage motors would be ideal. These motors are strong and robust and, owing to the absence of commutators and current-collecting gear, the maintenance is practically negligible. Many tanker vessels have now been equipped with this type of motor with extremely satisfactory results. Their application is peculiarly adapted to this type of vessel owing to the reduction in the fire risk due to the absence of any sparking which might arise from commutators. On this type of vessel there is also very little cargo-handling machinery.

As already explained, the A.C. motor is a constant-speed machine; that is to say, the speed remains practically constant no matter what the load may be. This type of motor is therefore at a disadvantage when put alongside an ungoverned steam engine, the speed of which



VICKERS' ELECTRO-HYDRAULIC SHIP'S STEERING-GEAR EQUIPMENT.

will depend upon the load. The A.C. motor can only be made to perform the work at the same speed as the steam engine by running it at the average speed and making it capable of taking the maximum load at this speed. This means a very much larger and more expensive motor unless speed is sacrificed.

The D.C. series-wound motor, on the other hand, does not suffer from this defect and can be made to follow closely the characteristic of the ungoverned steam engine by means of suitable devices. It is for this reason that direct current is usually adopted on cargo carriers where the winch load is considerable. There still appears to be a certain prejudice against the electric winch from the point of view of speed when handling the light hook. There is, however, no foundation for this in a properly designed electric winch.

Considerations in the Design of the Electrical Gear.

In all shipwork reliability is of first importance, and it might almost be said that reliability comes before economy because, if economy can only be obtained by spending long periods in port overhauling machinery, it is of no use to the shipowner. In many cases electrical apparatus designed for a cheap land installation has been placed on board ship with consequent trouble and loss. In installing electrical apparatus on board ship it does not pay to include anything that has not been designed for this class of work. There are, however, several manufacturers of electrical apparatus who have studied the conditions and are able to design apparatus which will give the utmost reliability in operation.

All motors in the engine-room should be fully protected from dripping water, leaky steam pipes, and, in the case of Diesel ships, from oil fumes. Totally enclosed motors should rarely be used in the engine-room except to do intermittent duty. Such motors are apt to be put away in some corner where there is very little movement of air, with the result that the heat cannot get away and the temperature of the motor rises rapidly. Care should be taken to see that wherever possible, and always in the case of large high-speed machines, the motors are placed with the bearings in a fore and aft direction. The bearings should be given special consideration to ensure there being no danger of the lubrication failing in a heavy sea. In this respect, and also from the point of view of oil economy, the ball or roller bearing has distinct advantages.

Motors on deck should be totally enclosed and watertight and, indeed, capable of withstanding the blow of a heavy sea. These motors are all of the intermittent-duty type. If the ship trades in tropical climates, the deck electrical machinery should be protected from the direct rays of the tropical sun. Special attention should be given to the insulation of all electrical apparatus, and this should be of a type which is able to resist the damp, salt atmosphere and the condensation which will occur.

The switchgear and starting apparatus should be of the simplest description and capable of withstanding rough handling. All starting gear should be totally enclosed in strong drip-proof, sheet-iron cases, with external operating handles of strong construction so that they cannot be broken. Starters should preferably be of the drum type or of a similar robust construction. The main switchboards are usually placed in a well-protected situation and can be of the open type, but special precautions should be taken with the insulation and the framework should be of heavy construction. It is usual to provide for a shore supply in arranging the main switchboard. In many ports it is possible to obtain a shore supply of power, enabling the boilers and the generating plant on board to be shut down entirely.

Cargo Winches.

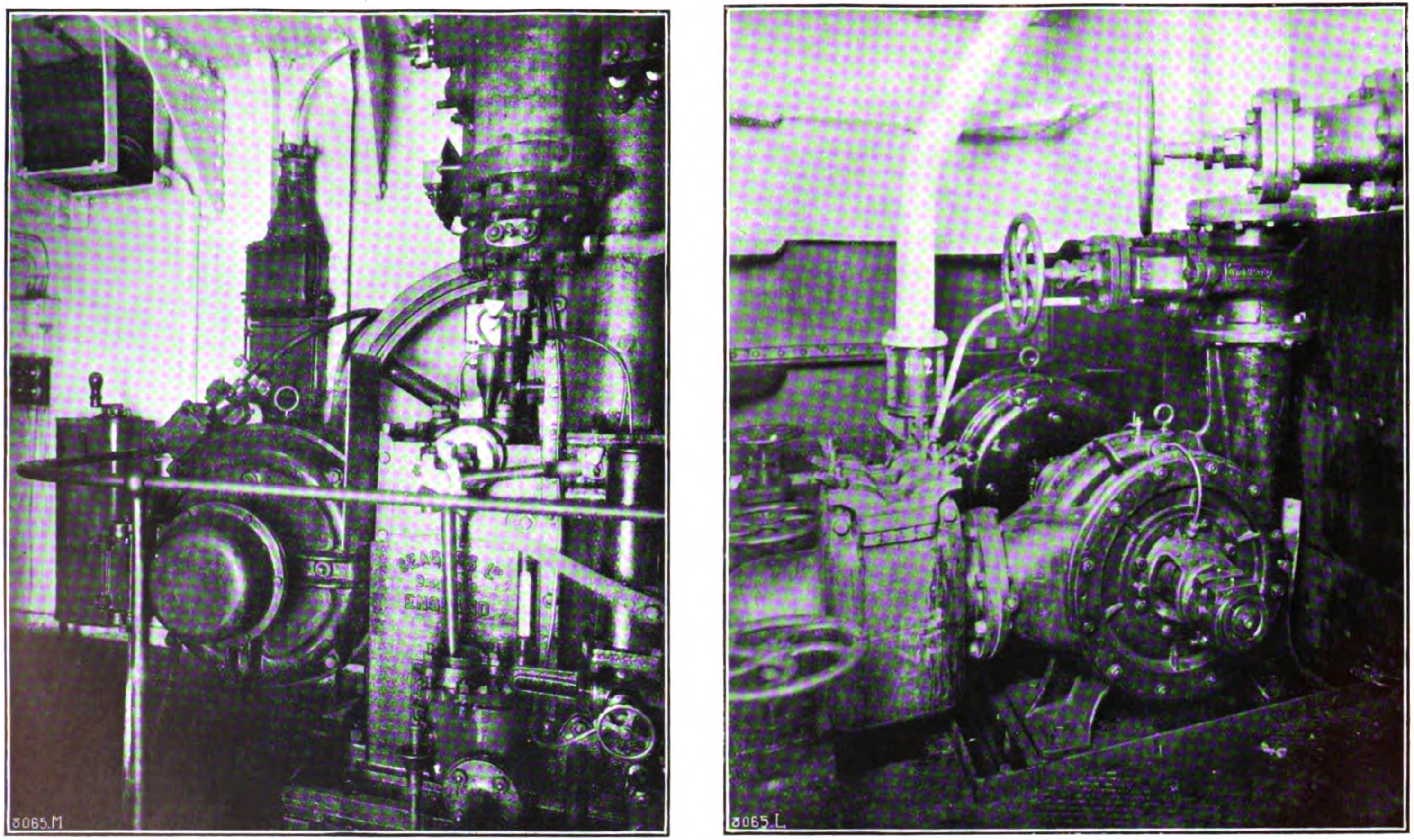
The best type of electric cargo winch is driven by a watertight motor having a magnetic brake, a centrifugal brake, and a slipping clutch embodied in the design. The motor should be controlled from a watertight master controller mounted in a convenient position.

On the Plate facing page 168 are reproduced photographs of a large spur-gear winch and of the contactor panel, the electrical gear of which was constructed by Metropolitan-Vickers Electrical Co. Limited., while the mechanical parts were made by Harfields of Blaydon-on-Tyne.

The arrangement illustrated is such that the control lever or handwheel can be thrown into any position without damage to the equipment. The contactor gear is usually placed between decks or in suitable deck-houses, or it can be mounted with the winch to form a complete unit. With this arrangement the roughest labour can be employed without fear of damage to the equipment. The acceleration of the motor is controlled automatically by the contactor gear, and no matter how quickly the controller handle is moved the motor accelerates at a pre-determined rate. The magnetic brake comes into operation in the off position of the controller and holds the load. In addition to the magnetic brake, a foot brake should be provided interlocked with the contactor gear so that power is cut off immediately the brake is applied. The centrifugal brake comes into action when lowering heavy loads and prevents the load overhauling the motor and descending at too great a speed and causing damage to the ship or cargo. A slipping clutch is useful in the event of the hook catching and prevents accidents to the tackle, or the hatch coaming, but it is not essential.

Electro-Hydraulic Steering Gear.

The electro-hydraulic steering gear illustrated on the Plate facing page 170 is of the two-ram type, and was supplied for the motor vessel Itaguassu, built for the Brazilian Government. The ship is 280 ft. by 43 ft., having a loaded draught of 13 ft. 6 in., and a speed of 9½ knots. A Williams-Janney Variable Delivery Pump is employed, driven by a direct-current motor running at constant speed. The pump supplies oil at pressures up to 1,000 lbs. per square inch to each cylinder alternately, according to the variable



ELECTRICALLY-DRIVEN REFRIGERATING MACHINERY AND CARGO-OIL PUMP FOR TANK STEAMER BRITISH COMMODORE.

requirements of the bridge control. The Williams-Janney pump is controlled by a Brown's telemotor installation having the transmitter on the navigation bridge. The operating cylinder which moves the swash plate controlling the delivery of the oil to the rams is, of course, fitted in the steering compartment.

The gear is self-contained, compact, and designed to reduce to a minimum the work of erection and alignment on board. The whole of the electro-hydraulic part of the gear is complete in itself, forming a single unit, not composed of separate items. The control gear is arranged to operate the helm to a fraction of a degree, and the cut-off mechanism will hold the rudder in any desired position. A self-centreing device is fitted which returns the rudder to the central position when the helm is out of control. A mechanical standard is fitted on the poop deck above as a secondary means of control to the telemotor gear. This is clearly shown in the illustration and, in addition, to meet Lloyd's requirements, hand steering-gear is fitted for ready use in the steering compartment. This hand steering-gear is so arranged that, by means of a friction clutch, it can be brought into service in a few seconds.

The mechanical portion of the gear was manufactured by Messrs. Vickers, Limited, who supply similar equipment for vessels up to 10,000 tons deadweight, having rudderstocks up to 12 in. in diameter. For larger tonnages and rudderstock diameters, steering gears of the four-ram type are supplied. In the case of these larger gears duplicate Williams-Janney pumps and motors are supplied as a stand-by, and these replace the hand steering-gear shown. These four-ram-type gears are all designed to give exactly the same refinements of control as are obtained with the two-ram type.

Refrigerating Machinery and Cargo-Oil Pumps.

The refrigerating machinery shown on the Plate facing page 172 is electrically driven by a motor of the squirrel-cage type. Owing to the pulsating character of the load, it is an advantage to equip these machines with a flywheel and to drive through some form of flexible coupling. The simplicity of the starting device used with this type of motor is a strong point in its favour.

Centrifugal pumps for cargo-oil have also been arranged for driving by squirrel-cage motors, and equipment of this type has been fitted in the tankers British Viscount and British Colonel. This type of pump has not been used, so far as the writer is aware, with heavy asphaltum oils, but the motor drive is also applicable to the reciprocating type of pump which is regarded as essential for these oils. No difficulty has been experienced in emptying the ship with the centrifugal pumps, and their operation has been entirely satisfactory over a number of years.

Owing to the danger of fire, special precautions had to be taken, in the installation referred to, to ensure that, in the event of a breakdown of any part of the electrical gear, the oil fumes could not be ignited in any way. The use of a flame-tight motor was not regarded as a sound solution of the problem, as this would have involved the use of a very large and clumsy motor owing to the fact that the pumps have to operate continuously when emptying the ships. It was therefore decided to enclose the motors completely, but to ventilate them by means of special pipes connected to a small motor-driven blower located in a suitable deck-house. The cables feeding the motor were taken down the ventilating pipe.

The arrangement adopted maintains the motor casing and piping at a pressure higher than the atmosphere, so that oil fumes cannot leak in. In order to insure that the whole of the piping and motor casing is cleared of fumes after a shut-down period, the pump motor is arranged so that it can only be started after the blower has been running for a sufficient time to drive off the fumes. The starting arrangement, however, is quite automatic and foolproof, one operation of closing a master switch serving to set the whole of the gear in motion.

The electrical equipment for both the refrigerating machinery and cargo-oil pumps was supplied by the Metropolitan-Vickers Electrical Co., Ltd.

CONCLUSION.

In this chapter the author has endeavoured to describe the position of electric propulsion and electric auxiliaries as they stand to-day, without prejudice or favour. No attempt has been made to go into details of the design of the electric machinery except on the broadest lines, since it would be impossible to do this usefully in the space available.

It is not difficult to see why the application of the electric drive has made slower progress on board ship than on land. The old school of seagoing engineers still regards everything electrical with a certain amount of suspicion, and until a course in electrical engineering is included in the training of the marine engineer he is likely to continue to do so. In spite of this, the electric drive of auxiliaries has established itself, and its applications will continue to increase.

With regard to electric propulsion, this will undoubtedly find its application in time. Very wide and sweeping claims are made for it by its adherents in the American Navy. As far as economy is concerned, however, it is questionable whether many of these claims can be substantiated. At cruising speeds it should be possible to show some slight advantage. It is almost impossible to get comparative figures which can form the basis for a conclusion. There can be no doubt at all, however, that there is considerable advantage to be obtained in manœuvring qualities and handiness in emergency of an electrically-propelled ship which cannot be obtained by any other form of propulsion. True progress, however, can only be obtained by electrical and mechanical engineers working together.

L. MILLER.

CHAPTER IX.

THE DEVELOPMENT OF BLOCKADE POLICY.

IN May 1689 Great Britain and Holland proclaimed a blockade of all the coasts of France. The measure was a new one. Coasts had, it is true, been proclaimed under general blockade before; but attempts to prohibit all commerce to and from an enemy state had never been seriously enforced. Bynkershoek collected all the instances that he could find; but hardly discussed them. Loccenius, who was less well informed, had dealt with the matter in a very abstract fashion. He asked simply whether or not it would be permissible for a country at war to stop all commerce to and from an enemy's ports; and decided that it could only be defended by giving a belligerent application to the old theory of a *dominium maris.*

The maritime Powers were thus quite clear that they were making an innovation, and, in consequence, they worded their proclamation very carefully. They were right to be apologetic; for their announcement ran counter to treaty law in every possible respect. It was alike a challenge to the rights of neutral commerce as then understood, and a forecast of over a century of British policy. A brief review of the law, as it then stood, is necessary to obtain a clear understanding of the significance of our proclamation under either head.

THE RIGHTS OF NEUTRALS.

First, every neutral nation in Europe had an absolute right to trade and traffic as it chose without interference from states at war. Belligerent navies could not even examine neutral ships, or inspect their cargoes, so long as the master produced a pass in which an Admiralty official of his own country certified that the vessel was not carrying contraband. This pass was a sort of magna charta of neutral rights; and was annexed regularly to every treaty of commerce and navigation. Belligerent right of interference was thus strictly limited to contraband, and this was defined in the most rigid manner possible. Lists were attached to every treaty and they never varied. Essential military stores: guns, gun-carriages, gunpowder, muskets, helmets, cuirasses, and a few other objects of a similar kind could be declared contraband; but nothing else. These rigid rules did not end the restrictions to belligerent action at sea. Neutral commerce was further protected by inserting in the existing treaties, lists of cargoes which could not, in any circumstances, be declared contraband. Amongst the exemptions were "everything by which human life" was "supported"; corn, wine, brandy, salt, and all shipbuilding materials such as timber, hemp, tar, pitch, and cordage.

Secondly, the principle that goods carried by a neutral vessel were themselves neutral was universally admitted; as it was embodied in the treaties between France, Great Britain, Holland, and Sweden, in force before war was declared.

In one set of circumstances only could a belligerent stop all neutral and enemy commerce. If directed to a place which was completely besieged he had the right to do so, but the words used enclosed the right within very narrow boundaries. Goods not contraband could be stopped and confiscated if they were going to or coming from *loca obsidione circumsessa;* that is places surrounded by land and sea. The formula could not possibly be made to cover a purely maritime blockade.

On the Eve of the Great War.

Nobody can read this proclamation and compare it with the rules of international law which then obtained recognition without coming to two conclusions. First, it is not right to say, as is often done, that, when we declared war in 1914, diplomacy, conventions, and agreements had so whittled away our belligerent rights that we were less able than ever before to control our enemy's sea communications. Quite the contrary; we began our war with Germany with a rich heritage of privileges which had been fought for and won by four generations of British ambassadors.

Secondly, if we wish to decide how far our rights and privileges at sea have advanced or receded; and if we wish to make a rational prophecy of their future history, it is not enough to compare our position before and after the "Declaration of Paris," or to contrast the measures with regard to neutral commerce which we took between 1914 and 1918, with those enforced during our war against the Napoleonic Empire; for these latter came in the culminating phase of our maritime wars; and are, therefore, a mere episode in a far longer history. The comparison between past and present must be pushed much farther back, and spread over a much longer period if we are to form a right judgment. If ever made, a study of the kind will fill several volumes: and no attempt can be made here even to outline their contents. Our examination of the proclamation of 1689 is not, however, quite concluded. It remains to be seen what happened when it was circulated in the chancelleries of Europe and when measures were taken to give effect to it.

"A Dangerous Consequence."

Sweden's attitude in the war was more important to us than that of any other neutral. Her commerce with France in shipbuilding materials supplied the French Navy, and her military and naval power would, if thrown into the contest, have decided its issue. The Chancellor, Bengt Oxenstiern, was what we should call "pro-ally"; but there was a very powerful party in the King's council entirely given over to French interests. Our envoy, Mr. William Duncombe, presented the proclamation with the usual diplomatic justifications. How Bengt Oxenstiern received it we do not know; but its effect upon the Swedish people was instantaneous. For no sooner was this communication made than "people of all degrees and conditions were busily employed to decry the proceedings. . . . Accordingly, as all were ready to give their judgments against us, so the College of Commerce had forthwith to give their opinion on the case. In this document they deduced that the prohibition was prejudicial to Sweden . . . that France with as much reason might, and in all probability would, disturb their trade with England and Holland, and even that to Portugal for salt would not be safe. That it was of a most dangerous consequence to Sweden to admit of such a restraint without antecedent communication and contrary to treaties; and that they that did this much, with such a war on their hands, might pretend when more at their ease, to shut up the Channel in time of peace." *

The reception in Denmark was no better; and to the natural indignation of the Danes was added the fear that Sweden, by taking the first effective step would maintain a "higher dignitas Imperii" than they. At the Hague Lord Dursley, the British Envoy, and Heinsius, the Grand Pensioner to the States-General, received very strong protests. In this very unfavourable atmosphere our envoys began a long process of diplomatic bargaining. Their proposals are well worth notice; for they contain the germ of almost everything which was done between 1914 and 1918.

SANCTION FOR THE BLOCKADE.

As it was quite obvious that the blockade proclamation could not be defended as a legal measure, Mr. Duncombe searched for expedients which would do as a substitute. He obtained statistics about Swedish export trade and came to the conclusion that, though they could not be dealt with as a whole, Great Britain might buy up all stores of pitch, tar, and hemp which would ordinarily be sent to France, and so cut off an essential source of naval equipment. It is to be noticed that though his whole object was to stop commodities essential to the French Navy, he never seems to have suggested that they could be declared contraband. He then found that the export of tar, pitch, and hemp was controlled by four merchants, and was thus in the hands of what we should call a "Trust"; and with them he opened negotiations. After prolonged discussion they broke down; pressure was put on the Trust by the French party in the King's council; tempting prices were offered by French agents at Stockholm, and the Swedish merchants broke their bargain with our envoy almost as soon as they had concluded it. "The only truth and sincerity" with which Mr. Duncombe could charge them "in the whole affair," was "a determination to break down the prohibition if they could."

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* Mr. Duncombe to Lord Nottingham. Report on his return. State Papers, Foreign—Sweden.

RATIONING PROPOSALS.

Having thus failed in their first effort, our envoys made a second proposal for which Lord Dursley, at the Hague, was, in the main, responsible. Though the measure which he suggested is not quite the same as the rationing of neutral countries, which was the very essence of our blockade of Germany, it none the less has a curious resemblance to it. It was: (i) that the maritime powers should allow a certain, specified, number of Swedish vessels to go to France, but no more; (ii) that the number of cargoes so licensed should have just the value necessary to ensure Sweden her usual imports of French oil, wine, and brandy; (iii) that the granting of passes to these ships should be transferred from the Swedish Government to the Governments of Great Britain and Holland; and (iv) that measures were to be taken to prevent cargoes thus licensed from being landed at ports of the Empire *in transitu.* The proposal was met by the most unflinching diplomatic resistance: every clause in the draft agreement was answered by an emphatic *non possumus.*

Having thus failed to secure any workable substitute for our attempted blockade, our envoys fell to purely political measures, and strove to persuade Sweden to join the allies and declare war upon France. In this they were quite unsuccessful. The Swedish Government remained neutral to the end; and the Danes followed their lead. Apart from this, the two Powers compounded an agreement providing that their navies should convoy the trading ships of each country, without discrimination; and signed a formal treaty in which they promised to assist one another to maintain "free commerce."

RIGHT OF VISIT AND SEARCH.

By 1691 the attempted blockade had practically ceased to receive consideration. The States-General admitted its failure by signing a treaty of commerce with Denmark, which contained all the rules protecting neutral commerce from belligerent interference. The only positive result of the experiment was a further commercial treaty between Great Britain and Denmark, in which the Danish Government undertook (i) to put liquid tar on its contraband list, and (ii) to forbid their vessels to engage in the French coasting trade. As Mr. Duncombe's letters leave no doubt that tar exports were controlled exclusively by Swedish merchants, the concession was not very valuable. For the rest of the war we had to watch neutral commerce sailing to and from French ports without hindrance. We seem to have compelled a certain relaxation of the rules regulating the visit and search of neutral vessels; for when a squadron under Hidde de Vries was defeated by Jean Bart in the North Sea, the Dutch ships had dispersed to examine the cargoes of a fleet of Swedish and Danish merchant vessels, under the convoy of four men-of-war. The circumstances are not, however, very clear, and whatever encroachments we may have made on the existing rules, we were still very far from being able to argue that visit and search was the uncontested right of a maritime belligerent.

THE CONVENTION OF PARIS AND THE DECLARATION OF LONDON.

It is not possible to reconcile these facts with the current theory that our belligerent rights at sea had been crippled by the Convention of Paris and the Declaration of London. The true statement of the case is this. When we opened the long series of our wars with France in 1689, we proclaimed our intention of controlling our enemy's communications by naval means: the ultimate object of all sea warfare. Such a use of maritime power was practically unknown in history, and was not admitted in law; in addition to which the existing state of naval construction did not allow vessels to keep the sea for long enough to enforce a maritime blockade. As was to be expected our pretensions were not admitted. They obtained no recognition either in theory or in practice, and had to be dropped.

As an immediate measure they failed: as a prophecy they were fulfilled. For two hundred and twenty-five years we strove to give new life to this still-born proclamation; in the end we endowed it with a tremendous existence; and between 1914 and 1917 we achieved all that Lord Dursley, Lord Nottingham, and Mr. Duncombe had attempted.

THE BLOCKADE OF THE GREAT WAR.

After two preliminary Orders in Council we stated our intention to cut off all the enemy's sources of supply and all her exports. Neutrals protested but acquiesced; and we gave effect to our intentions. By slow, methodical steps we built up a system of rationing to which every state with an export trade to Germany was subjected. They saw their exports decline, their wealth and their food supplies fall off; but they consented to our measures, as we could always promise a still further restriction in their supplies if they refused. They watched our blockade organisation spread itself in all countries, and saw their own traders' liberty subjected to our good will and pleasure. After protesting, they acquiesced in our "black lists" and our Acts of Parliament for restricting the enemy's supplies. They watched us issue punitive regulations about supplying coal to their ships, and, in the end, consented to the conditions upon which we undertook to remove our prohibition. Finally, they saw us requisition their ships and appropriate the greater part of their merchant fleet to our own uses; and these measures were cemented by legal agreements.

PART OF THE LAW OF NATIONS.

It is not the purpose of this article to examine whether these measures will be possible in a future war: doubtless a great number of them were due to circumstances which will not repeat themselves. What does concern us here is that this system of blockade, without restraint or limit, is now part of the law of nations. The Covenant of the League of Nations imposes upon all signatories the solemn obligation of applying it in certain circumstances. Whether that part of the agreement will ever be effectively put into force cannot be foretold; but it can be said, with certainty, that any maritime State at war with another will henceforth have a solid legal justification for the most drastic measures of interference with neutral commerce. The problem which thus confronts us is, therefore, not how it has come about that our rights in war have been curtailed, but how it is that they were ever allowed to obtain such an enormous extension, and how the principles of maritime blockade in 1689 were ever expanded to those of 1917.

The matter can only be understood by disregarding details and paying close attention to certain general principles. The rules of maritime law which existed at the end of the seventeenth century were strictly logical deductions from a few abstract questions of law and reason. Treating neutral States in war like merchants who are doing business with two traders engaged in litigation, it was argued, that, in a quarrel between two parties, outside persons had a right to stand aloof from the dispute, and an obligation not to foment it. From this simple principle flowed the rigid restrictions on belligerent rights at sea, and the rules of contraband; but it should be remarked that the obligation not to supply matter for inflaming the contest rested with neutrals only. They, and not the belligerents, were responsible that the Powers at war were not supplied with warlike stores. Had any Government in those days allowed its foundries and iron works to supply a belligerent state with arms and munitions, it would have violated every treaty of commerce and navigation in existence.

BELLIGERENTS ASHORE AND AFLOAT.

To these principles another was added. Belligerent rights were further defined by applying certain rules of war on land to war at sea. International law of those days placed very little restriction upon a Power which had effectually occupied a piece of enemy's territory in war. It could be exploited at will, and all private property within it was at the conqueror's mercy; not even the property of neutral persons was exempt from confiscation. Jurists therefore concluded, that, when a naval force could do at sea what an army of occupation could do on land—that is, when it could completely isolate everything within a given area of water from all communication with the outer world—all restraints ceased, and it was free to do as it wished with all it found within it. The analogy was pushed to its most rigorous conclusion: blockade from the sea alone would not suffice; the place must be "completely invested" (*obsidione circumsessa*). These rules were elastic in one respect, which was of great importance. If the sea-keeping capacity of fleets increased, their ability to occupy areas of the sea effectually and continuously would rise in proportion: they would thus more and more be able to assimilate their action at sea to the action of armies on land, and their rights against neutral commerce would expand in consequence. We know the outcome. The sea-keeping capacity of fleets did increase; their power to blockade places became effective; the old rule about completely invested places disappeared, and a claim to stop all enemy's supplies replaced it. The growth of belligerent rights at sea between 1689 and 1815 is thus no more than a deduction from a legal hypothesis.

FIRM FOUNDATIONS.

No such background of law and reason is traceable in the measures we took against enemy commerce between 1914 and 1918. Certain persons have suggested that when we stopped neutral exports to Germany by rationing neutral Powers, we were simply adapting other doctrines of continuous voyages to modern conditions; but the analogy will not bear examination. Others have argued that the whole of our blockade measures rest upon the doctrine of legitimate retaliation; and that it would have been impossible to apply them but for Germany's breach of the law of nations. This may or may not be true, but it does not give the British blockade a legal basis.

But though the economic blockade of Germany lacks any legal precedent, it is none the less on very firm foundations. It rests on the fact that modern trade is international in the strictest sense of the word, and that practically every industrial operation is completed by the co-operation of several countries. If, then, the nation which is dominant at sea has a large number of neutral clients, she can close bargains with them to the detriment of her enemy; and a modern blockade consists in these bargains and agreements. Neutral clients of Great Britain, being thus obliged to choose between two very serious alternatives, generally chose the one which was least damaging to themselves; that is, compliance with our demands. As the industries of a large part of Europe, the railways of the greater part of South America, and the sea-borne commerce of more than half the world depend upon British coal, we were generally in a position to enforce our wishes.

If, then, our power to control an enemy's commerce and sea communications has increased, almost beyond measure, during the past two centuries, the expansion cannot be attributed to a single cause; from 1700 to 1815 it was a corollary to the growth of our strength at sea; from 1815 to 1914 it was the outcome of a set of far more complicated causes, of which our naval power was only an item.

ARCHIBALD COLBECK.

CHAPTER X.

THE INSTITUTION OF NAVAL ARCHITECTS AND ITS WORK.

WITH the wider expansion of the subjects treated in the "Annual" it does not seem inappropriate to include in this year's volume a brief account of the Institution of Naval Architects, which, since its foundation in 1860, has ceaselessly laboured to promote the development of naval architecture, both on the scientific and on the practical side. Some seventy years earlier there had existed a "Society for the Improvement of Naval Architecture" whose brief span of life (1791–1799) was brought to an untimely close, owing to lack of support, and to difficulties due to the unsettled state of Europe. The Meetings of that Society, nevertheless, gave birth to a number of original papers, and also to the historic experiments on the resistance of floating bodies carried out by Col. Beaufoy on behalf of the Society. The results of these experiments are fully described in the two monumental volumes which he published in 1834, entitled "Nautical and Hydraulic Experiments."

The constitution and aims (and even the rate of subscription!) of this eighteenth-century Society of Naval Architects * so singularly resemble those of the present Institution that it is permissible to suppose that they may have been familiar to those who, seventy years later, laid the foundations of the present Institution of Naval Architects, but no certain corroboration of this can be offered.

The earlier Society was inaugurated under favourable auspices which gave promise of a brilliant future. Its first (and last) President was no less a personage than the Duke of Clarence, who afterwards became King William IV. Captain Sir John Borlase Warren, R.N., F.R.S. (later Admiral of the Blue) presided, as Vice-President, over the meetings. Papers were read, and no doubt were discussed with the same fervour that was to characterise those of seventy years later, and encouragement was given to inventors by the offer of medals and other prizes for the best solutions of the problems of the day—prevention of fire on board ship, saving ships from sinking, freeing ships of water, the placing of masts and yards, etc., etc. But the difficulties of ways and means and the calls made by the War on the naval officers who formed a large proportion of its members became too great for so small a body (270 members), and the dissolution, which was finally decided upon, was destined to cause a long break in the continuity of the development of the science of naval architecture in England. A School of Naval Architecture was, indeed, opened at Portsmouth in 1811 under Dr. Inman, but it only continued until 1832, and even

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* See a paper by Mr. A. W. Johns—*Trans. I.N.A.*, 1910.

HIS GRACE THE DUKE OF NORTHUMBERLAND, C.B.E., M.V.O.,
PRESIDENT OF THE INSTITUTION OF NAVAL ARCHITECTS. ELECTED 1921.

thus it only partially filled the gap, for it could not supply facilities for exchanging views and experience between professional naval architects, naval officers, shipowners, and shipbuilders. This school was revived at Portsmouth in 1848, but after a brief period of five years, during which only twenty students passed through the course, the school was closed down, and England remained without any national establishment for the education and training of her naval architects.

Formation of the Institution.

The lack of facilities for either learning the principles of naval architecture or discussing their application to practical problems formed a conspicuous source of weakness to the shipbuilding and shipowning interests of the country, and those who felt most keenly the disadvantage under which British shipbuilders were labouring finally determined that steps should be taken forthwith, first, to form a society that should adequately represent these interests, and, secondly, to press upon the Government of the day the urgent need for providing a college where naval architects could be trained. John Scott Russell, then in the front rank both as a shipbuilder and an engineer, had also had helpful experience as Secretary of the Society of Arts and organiser of the first International Exhibition of 1851. Early in 1860, at his home at Sydenham, he convened a meeting at which Dr. Woolley, Edward J. Reed, and Nathaniel Barnaby were present, and outlined proposals for the formation of an Institution of Naval Architects, and—best of all—guaranteed the initial expenses. Reed undertook the secretarial duties, and thus two of the corner stones of the edifice were well and truly laid. Shortly after, on January 16, 1860, a formal meeting was held at the Society of Arts, with Mr. H. Chatfield in the chair, when Mr. Reed outlined the scope and objects of the new society. The names of those who were present at this historic meeting, many of whom were destined to achieve high eminence in their profession, deserve mention:—The Rev. Joseph Woolley, M.A., LL.D., F.R.A.S., late Principal of the School of Mathematics and Naval Construction, Portsmouth; John Scott Russell, F.R.S., Shipbuilder and Engineer, Millwall, and Vice-President of the Institution of Civil Engineers; John Penn, Engineer, Greenwich, President of the Institution of Mechanical Engineers; Henry Chatfield, late Master Shipwright of the Royal Victoria Dockyard, Deptford; John Grantham, Consulting Naval Architect, London; Oliver Lang, Master Shipwright of H.M. Dockyard, Chatham; James Martin, Surveyor to Lloyd's Register Office, London; Alexander Moore, Assistant Master Shipwright, H.M. Dockyard, Chatham; J. Horatio Ritchie, Surveyor to Lloyd's Register Office, London; W. Braham Robinson, Assistant Master Shipwright, H.M. Dockyard, Sheerness; Philip Thornton, Assistant Master Shipwright H.M. Dockyard, Woolwich; George Turner, Master Shipwright of H.M. Dockyard, Woolwich; John White, Shipbuilder, West Cowes, Isle of Wight; John MacGregor, Barrister-at-Law, the Temple, London; Nathaniel Barnaby, F. Kynaston Barnes, and J. B. Chessell Crossland, of the Department of the Controller of the Navy, Admiralty, Whitehall, late Members of the School of Mathematics and Naval Construction, Portsmouth; and E. J. Reed, late Member of the School of Mathematics and Naval Construction, Portsmouth. Reed's opening speech, which is given in the first volume of the Transactions of the Institution, shows vision and foresight. In outlining the scope of the new society he was careful to lay stress on the need for associating with shipbuilders and marine engineers representatives of those other professions which constitute important branches of allied interests—naval officers, shipowners, yachtsmen, and persons whose business or vocation renders them able to discuss with naval architects the qualities of a ship or her equipment. It was to this catholic attitude towards those who were not professionally qualified as naval architects in the strict sense of the term, that much of the success of the Institution, especially in its early days, has been due. The general objects of the new society were specifically laid down at this meeting, and the following resolution was carried unanimously:—

"We who are present do now constitute ourselves an Institution of Naval Architects for the purpose of advancing the science and the art of Naval Architecture."

The birth of the new Institution was now an accomplished fact.

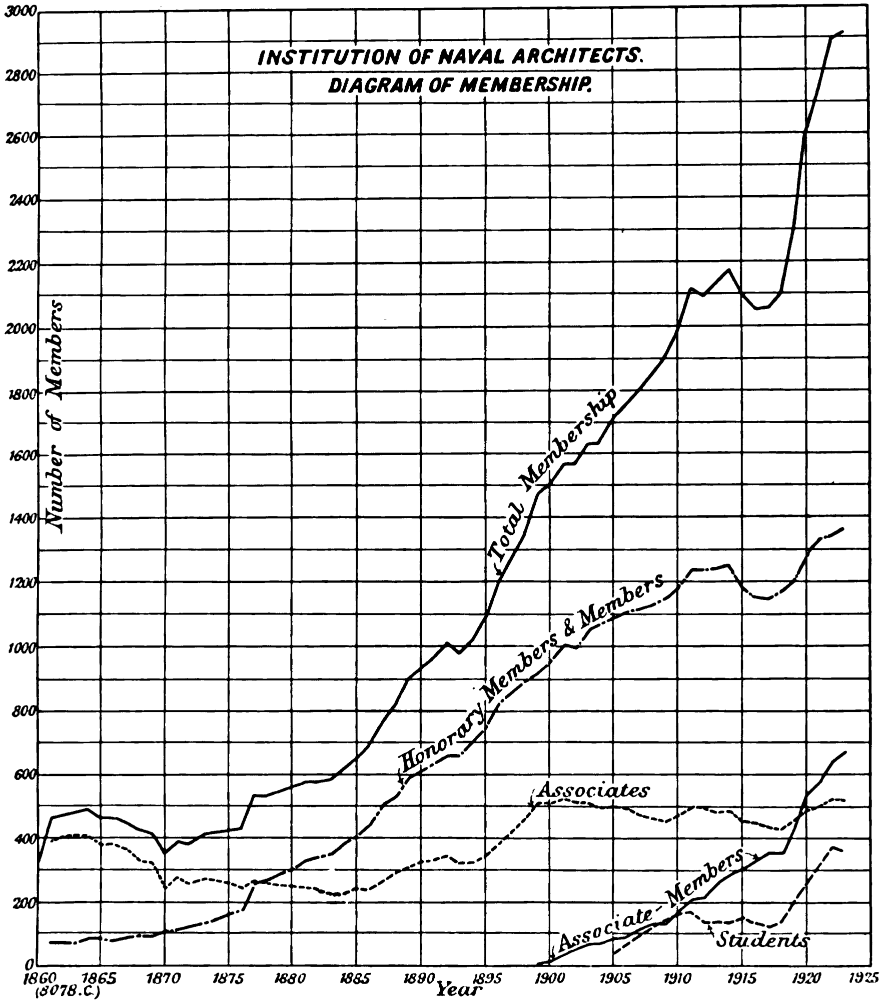
First President and Officers.

For a President, the first choice fell upon the Duke of Northumberland, grandfather of the present distinguished holder of that office. He was obliged to decline the honour, and Sir John Somerset Pakington (afterwards Lord Hampton) was unanimously elected. Having recently relinquished the office of First Lord of the Admiralty, Sir John Pakington was peculiarly fitted to guide and assist the early steps of the newly organised body. A distinguished list of Vice-Presidents, including the Earls of Ellenborough and Hardwicke, Sir Francis Baring, Sir James Graham, Lord Clarence Paget, and on the professional side, Scott Russell, Isaac Watts, John Penn, Rev. H. Mosely, and Rev. Joseph Woolley made an imposing array, while the Council included other leading men of other day in shipbuilding and marine engineering: Henry Chatfield, J. Fincham, John Grantham, J. R. Napier, J. H. Ritchie, and J. D'Aguilar Samuda, the latter also holding the office of first Treasurer of the Institution. Among other names occur those of Sir William Armstrong, the founder of the great firm that bears his name, Captain Halsted, and J. Maudslay, the famous Thames-side engineer.

The composition of the Council is indicative of the strong initial support which the Institution received from all the best known people in the shipbuilding world, and it was thus enabled to command confidence and respect. No time was lost in getting the members together, and on March 1, 1860, the first general meeting was held at the Society of Arts, when an excellent set of papers was read and discussed. Mention need only be made of contributions by Grantham and Fairbairn on the Strength of Iron Ships; by Samuel Read and G. Moorsom on Tonnage Measurement; by Scott Russell on the Wave-Line System of Ship Construction, and by Nathaniel Barnaby on Mechanical Invention in its Relation to the Improvement of Naval Architecture, to show the quality of the material presented at this first meeting of the new Institution.

Membership of the Institution.

The membership, which numbered at the outset 324, increased to 465 at the end of the first year. This number included 65 Members and 400 Associates and Honorary Members, but for nearly ten years the number of professional members did not exceed 100, while the total number remained under 500 until 1877, when the Institution held its first Summer Meeting at Glasgow. It is evident that, for the first seventeen years of its existence, the Institution, although producing valuable results in many directions, was resting



on a very slender basis of membership, and that the professional element was too small in comparison with the Associate class. This came about partly from a desire to keep at a high level the standard of qualification for admission to full membership, and partly from the fact that so many naval officers, and also marine engineers, who were taking active part year by year in the proceedings at the meetings were only qualified for admission as Associates. Thus for nearly twenty years the Associates outnumbered the professional Members. To-day the position is reversed, for the bulk of the support which the Institution receives from the Naval Service is in professional membership, derived not only from the Naval Construction branch, as formerly, but also from the engineers who now constitute such an important element of the Naval Service. From 1877 to the present time, and more particularly after 1886 when regular Summer Meetings were inaugurated, the growth of membership to the present total of nearly 3,000 has been continuous, with the exception of the War years, as can be seen from the diagram on page 185. The Associate class, however, has remained about stationary in numbers for the last twenty years, as a natural consequence of the specialisation which has taken place in all branches of engineering during that period, rendering the participation of non-technical persons in matters relating to naval architecture more difficult than was the case in earlier years. The establishment of the class of Associate-Member in 1899 and of the Student class in 1905, has no doubt contributed to the steady growth of the membership, which is also helped to-day by the greater part which the marine engineer is taking in the development of ship construction.

RULES OF ADMISSION.

Growth of membership is certainly one test of the vitality of any corporate body, but numbers alone do not ensure quality or efficiency, and the admission to professional membership must be carefully safeguarded if any real value is to be attached to that qualification.

From the outset, the rules laid down that, for corporate membership of the Institution, a candidate should be over twenty-five years of age, and should have been professionally engaged for at least seven years in some public or private shipbuilding establishment, and should secure a four-fifths majority of votes when balloted upon by the corporate members of the Institution. Marine engineers, who to-day constitute so vital a part in the professional membership of the Institution, were originally only eligible as Associates. This drawback, as has been mentioned above, was removed in 1869, when the rule was amended so as to admit "marine engineers conversant with naval architecture." For thirty years the rules relating to the admission of members remained substantially the same, but in 1899 it was decided to follow the practice adopted by the Institution of Civil Engineers by introducing an intermediate class of "Associate-Members," who were to consist of shipbuilders and marine engineers of over twenty-five years of age, to raise the minimum age for full membership to thirty years, and to introduce the additional condition of five years in a position of primary responsibility as a qualification for full membership. The Associate-Member class grew rapidly in numbers, and the keenness displayed to qualify for transference to full membership is a measure of the value placed by professional men on holding the Institution's diploma as "Member."

A further step in the development of the various classes of membership was the formation, in 1905, of the Student class, which allows young men from eighteen to twenty-five years of age, to join the Institution without entrance fee and at a nominal rate of subscription. Although it is difficult for Students, most of whom reside at the outports, to attend the Meetings of the Institution, yet nearly 400 are now enrolled; on reaching the age limit of twenty-five, they can apply for transference to Associate-Membership. The Student class consists almost entirely of apprentices or students in shipbuilding or marine engineering.

INTERNATIONAL CHARACTER OF THE INSTITUTION: INCORPORATION UNDER ROYAL CHARTER.

The international character of the Institution is shown by the geographical distribution of its membership, every continent and almost every country being represented, and the Transactions contain a large number of valuable papers which have been contributed by foreign members, many of whom occupy high positions in the technical branches of the profession in their own country.

On two notable occasions—in 1897 and 1911—an International Congress was held in London, which brought together representatives of all the principal maritime nations of the world. The second occasion, when the Duke of Connaught opened the proceedings (appropriately enough in the "Connaught Rooms"), also marked the Jubilee of the Society, and this event was further commemorated by the Incorporation of the Institution under a Royal Charter granted by His Majesty King George V., Patron of the Institution, after the application had been approved by the Privy Council in 1910. This step further strengthened the position of the Institution by recognition of its status as the leading society of its kind.

The numerous Summer Meetings, many of which have been held abroad at various times and which were so successfully inaugurated by that "Admirable Crichton," Sir George Holmes (Secretary of the Institution for 1878 to 1901) have tended to promote the growth of foreign membership, and great advantage has undoubtedly accrued to the progress of science from the free interchange of knowledge and opinions between the leading authorities in various countries.

In one direction only, and that due to the war, the foreign membership of the Institution has proved a source of difficulty. At the outbreak of that great calamity it was seen that nationals of enemy countries could no longer be allowed the privileges of membership, and the Council of the Institution gave the lead in this respect by removing from the roll of membership, in the autumn of 1914, all members belonging to enemy countries. About eighty members were affected by this decision, and their membership remains in abeyance until such time as they may be reinstated by the Council.

FOREIGN INSTITUTIONS.

The foreign membership of the Institution has had one very definite result, and that was to create in many other countries the desire to establish institutions that should carry on similar work for their own nationals. Thus it has come about that France, Germany, the United States of America, Italy, and Japan all possess societies closely modelled on our own. Germany, where the Institution held a Summer Meeting at Berlin and Hamburg in 1896, saw how great a factor in her naval development such a Society might be, and two years later the Schiffbautechnische Gesellschaft (Society of Shipbuilders) was founded. In less than two years it attained a membership of over 1,000. So greatly was the Kaiser impressed with the importance of developing that Society, and of assisting thereby the progress of his shipbuilding schemes, that he made an annual practice of attending the Meetings, often taking part himself in the discussions of highly technical papers.

America, in 1893, formally incorporated the Society of Naval Architects and Marine Engineers in New York, which has developed with vigour and success. Among the founders of that Society were Admiral Francis T. Bowles, trained at the R.N.C., Greenwich, Admiral W. L. Capps, at one time Director of American Naval Construction, who had received his early training at Glasgow University, and Charles H. Cramp, all of whom were members of the Institution of Naval Architects.

In France and Italy, societies similar in aims and character to those of our Institution have been founded, the former in 1888 and the latter in 1899. Monsieur Bertin, who two years ago celebrated the fiftieth anniversary of his election as Member of the Institution of Naval Architects, has presided for many years over the destinies of the French Society; while Signor Orlando, Hon. Member of the Institution of Naval Architects, was, until recently, President of the Italian Society, and made a practice of attending the Institution Meetings in London. Indeed, it may be said that the cordial relations which exist between the Institution of Naval Architects and its sister institutions in the principal maritime countries of the world have done much to foster good relations between shipbuilders and marine engineers of all countries, thus helping to counteract the disruptive influence between nations which a light-hearted public so freely ascribes, according to the mode of the day, to the machinations of diplomats, politicians, the Press, or the Law!

OFFICES AND MEETING PLACES.

The Institution settled in Adelphi Terrace from the very beginning of its existence. Its proximity to the Society of Arts where Scott Russell had been Secretary, and where the inaugural meeting of the new Institution had been held, made Adelphi Terrace a convenient locality for the Members. Various premises were occupied, first No. 7, then No. 9, and finally No. 5, the former home of that great actor, Garrick. The classic front of Adelphi Terrace, in its commanding position overlooking the Thames, is familiar to Londoners, but the interior decorations at No. 5 deserve special mention, as no better example of the beautiful work of the Adams Brothers, to whose skill Adelphi Terrace and the adjoining buildings are due, could be found than in these rooms, with their delicate tracery on mouldings, doors, windows, and mantelpieces, or the beautiful ceilings, with their panels by Angelica Kauffmann.

For the Annual General Meetings of the Institution the accommodation at Adelphi Terrace was inadequate from the first, and those Meetings had, until two years ago, always been held in the Hall of the Royal Society of Arts in John Street, Adelphi, where James Barry's well-known paintings, representing the triumphs of commerce and other allegorical subjects, had become a familiar setting for the annual gathering of shipbuilders and marine engineers. In 1921, it was decided, in response to an offer from the Royal United Service Institution, to hold the Annual Meetings in their handsome lecture hall, adjoining the Museum, which contains so many famous relics of the British Navy. The situation of that Institution, near the Admiralty and Westminster, offered distinct advantages, and although the severance of a long tradition of hospitality at the Royal Society of Arts was regretted, the transference to the newer and more central meeting place has undoubtedly proved to be an advantage to the Members.

ADELPHI TERRACE WHEN OFFICES OF THE INSTITUTION WERE FIRST OPENED.

THE "TRANSACTIONS" OF THE INSTITUTION.

The proceedings at the Meetings are recorded in a volume published annually in quarto form, and it would be quite impracticable, within the limits of the present chapter, to do even scanty justice to the immense field covered by the papers published in the "Transactions." Reference to only a few of the principal subjects that have been dealt with, and are recorded in the sixty-four bulky volumes to which the meetings have given birth, can be attempted here.

WARSHIP CONSTRUCTION.

Of all the subjects dealt with in the "Transactions" none has received more attention than warship construction. In 1860, as Sir Cyprian Bridge reminded us at the Jubilee meetings of the Institution, the seventeenth-century type of man-of-war was still represented in the British Navy; but an epoch of extraordinary innovation in naval construction then began. The next sixty years form a period of singular brilliance in scientific progress and of vigorous growth in industrial development. The change from sail to steam for propulsion and the gradual evolution from wood to iron and then to steel for materials of construction; the growth of the battleship from the 8,800 tons of the Warrior to the 41,000 tons of the Hood; the advent of the submarine and its growing importance in naval warfare; the introduction of aircraft as an essential part of the naval panoply of war—these, and a host of minor developments, have given endless food for thought and discussion. For many years the Institution meetings were regarded as the natural forum in which to expound fresh theories and discuss new designs under the benignant eye of an all-seeing Admiralty. The perennial battle between armour and armament; the rival virtues of broadside and turret; the age-long quest after the highest speed associated with the greatest power and surest protection—followed by the inevitable compromise to fulfil nature's inviolable laws—all in turn gave rise to spirited debates in which the forensic and technical skill of the great protagonists of opposing schools of thought were fully tested. Men's wits were sharpened and their views enlarged.

When, some years before the Great War, the general conditions of European politics led to greater secrecy being observed in all matters relating to naval defence, this policy reacted upon the freedom with which projected designs could be discussed, but the Institution has, nevertheless, been fortunate in securing at nearly all meetings—except those held during the War years—papers which, with the sanction of the Board of Admiralty, have been given by successive Directors of Naval Construction or members of their staff. The ground covered by these papers includes every form and type of warship, from the giant super-dreadnoughts to the impish motor torpedo-boats, darting at lightning speed to plant their wasp-like sting into an unsuspecting enemy. It would be difficult to overrate the importance of these papers and discussions in moulding public opinion on questions which, then as now, agitate the nation in its concern for the welfare of the Navy and the security of the country.

EDUCATION OF NAVAL ARCHITECTS.

The education of naval architects, from the earliest years, engrossed much of the attention of the Council of the Institution. Scott Russell, who in the first three years of the Institution's existence had given papers on such varied subjects as "The Wave Line Principle of Ship Construction," "The Professional Problem presented to Naval Architects in the Construction of Iron-cased Vessels of War," and "The Longitudinal System in the Structure of Iron Ships," read a paper in 1863 on "The Education of Naval Architects in England and France." This paper led to steps being taken by the Council of the Institution to urge upon the Government of the day the pressing need to reopen the School of Naval Architecture; and in this they were successful. Four years later, in a paper on "Technical Education of Naval Architects in England," Scott Russell returned to the subject and outlined what had been achieved, and what remained to be done. Since those days the subject has recurred at intervals in papers by Sir Wm. H. White in 1877 and 1911, William Denny in 1881, Prof. W. E. Dalby in 1903, Mr. Attwood in 1905, and others. Attention has thus been focussed on this important question, and for the wide facilities that now exist throughout the United Kingdom for the study of Naval Architecture in theory and practice, some credit may be claimed by those who have championed the cause of education in the arena of the Institution's Meetings.

WATERTIGHT SUBDIVISION OF SHIPS.

Safety of life at sea, depending, as it does, on many factors in ship construction, equipment, and navigation, has received in the "Transactions" close and frequent attention, and that branch of the subject which relates to the watertight subdivision of ships in particular has been often before the members. In the earliest volumes are contributions by Scott Russell, J. Grantham, E. J. Reed, F. K. Barnes, and others, dealing with bulkheads as a protection against foundering; in 1867, as the outcome of these discussions, the Council formulated certain recommendations, part of which were eventually acted upon by the Government. In 1882 and 1883, James Dunn read papers in which he called attention to the danger arising from bulkheads being fitted which did not rise above the load-water line. In 1890 a committee was appointed by the Board of Trade, under the chairmanship of Edward Harland, to inquire into the best method of subdividing ships so that they might float when so damaged that any two adjacent compartments were open to the sea. Two years later B. Martell, of Lloyd's Register, described the steps that had been taken by that Society to ensure greater safety by requiring bulkhead subdivision in excess of the earlier Board of Trade regulations under the Merchant Shipping Act of 1854. The problem, as might be expected, reached no finality, and when the Titanic disaster took place in 1912, a

"Bulkhead and Subdivision" committee, presided over by Sir Archibald Denny, was appointed.* The conclusions which this Committee arrived at were described in papers by Prof. J. J. Welch in 1915, and by the Chairman and Mr. Foster King in 1916. The subject, owing to its world-wide importance and the far-reaching effect upon shipowners and shipbuilders of any legislation that may be passed, is one which is engaging special attention at the present time.

Freeboard and Loadline, upon which safety of life and property at sea also depend, have been the subject of frequent discussions at the Meetings of the Institution, and also the question of the strength of ships: E. J. Reed, J. Grantham, and William Fairbairn, William John, Macfarlane Gray, W. E. Smith, S. P. Thearle, F. Elgar, J. H. Biles, and J. Bruhn, have all added to our knowledge of the behaviour of ships at sea, and much of their work recorded in the "Transactions" has subsequently become part of the recognised text-books on naval architecture. The testing of materials and riveted structures has also formed the subject of much patient research and experiment. In the bibliographical summary at the end of Dr. Montgomerie's paper, read in 1923, is given a list of papers, most of which have appeared in the "Transactions" of the Institution, dealing with the strength of riveted joints.

SHIP RESISTANCE AND PROPULSION.

The long series of papers on the theory of ship propulsion and resistance, deduced from results obtained in the Experiment Tank, which William Froude had initiated, and which his son, R. E. Froude, so ably continued, form an outstanding feature of the "Transactions." It is hoped that some day these papers may be collected and collated so that future investigators may find it easier to carry on the still unfinished work of these two great pioneers. Froude's description of the famous "Greyhound" experiments was laid before the Institution in 1874, and constituted a notable milestone on the road of scientific research in ship-resistance problems. Research work on ship-model resistance is now carried on at the William Froude Tank at the National Physical Laboratory, Teddington, an account of which was given by Sir William Smith in the "Annual" for 1920–21. The movement for building this tank originated at the Summer Meetings of the Institution which were held in Glasgow in 1901, when the need for a national experiment tank was strongly advocated. Subsequently, owing to the generosity of Yarrow, the tank was built and its maintenance has been assured through the action of the Council of the Institution in enlisting the support of a number of shipbuilding and other firms.

The rolling and pitching of ships and their behaviour amongst waves is another subject upon which much has been written in the "Transactions." The two Froudes, Scott Russell, Rankine, Joseph Woolley, Philip Watts, and Emile Bertin, have all made notable

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* Another committee on "Boats and Davits," under the chairmanship of Sir John Biles, was also appointed.

LORD HAMPTON
(1860-1880).

LORD RAVENSWORTH
(1880-1893).

EARL BRASSEY
(1893-1896).

THE MARQUIS OF LINLITHGOW
(1896-1901).

FORMER PRESIDENTS OF THE INSTITUTION OF NAVAL ARCHITECTS.

contributions, and among the Italian investigators may be mentioned Scribanti and Russo, the inventors of the "navipendulum" for reproducing actual rolling conditions from given data of a ship's characteristics. Means of checking rolling have been devised and described and discussed at the Meetings, such as the anti-rolling tanks installed by Philip Watts in the Inflexible in 1873, and developed later by Frahm for use on large passenger vessels.

PROPELLING MACHINERY.

Marine engineering problems, no less than those of shipbuilding, have engaged attention at the Meetings from the first, and, at the present time, papers on this branch of naval architecture form an increasing proportion of those embodied in the "Transactions." The various phases in the development of the marine reciprocating steam engine—from simple to compound, and then to triple and quadruple expansion—have in past years provoked most interesting discussions. The great controversy that arose when water-tube boilers were first proposed for adoption in the Royal Navy will be remembered by many members, and to this question John Durston, then Engineer-in-Chief, made several notable contributions.

No type of marine engine has, perhaps, received closer or more sustained attention than the Parsons turbine, and all the salient steps that have enabled this wonderful instrument to keep its place in competition with other types of engine have been successively described and discussed at the Meetings of the Institution. To-day the internal-combustion engine has come into the field as a formidable rival to the turbine, and papers on various aspects of the Diesel engine for marine propulsion have been read and discussed.

Propeller problems have been dealt with in a great number of papers, and descriptions of many novel and ingenious proposals for increasing propeller efficiency have been brought before the meetings. Results of progressive trials and experimental investigations have added to our knowledge without, however, exhausting the field in a subject full of pitfalls, difficulties, and apparent anomalies.

AIRCRAFT CONSTRUCTION, ETC.

When it became necessary, during the War, to undertake airship construction, it was the naval constructor who proved to be best equipped for the difficult problem of designing structures which, although superficially so different from surface craft, yet depended upon the same basic principles for construction. Thus it came about that valuable papers were contributed to the "Transactions" on these lighter-than-air craft by members of the Royal Corps of Naval Constructors.

Launching problems, tonnage measurement, experiments on the corrosion of propellers and condenser tubes, the design and functions of auxiliary engines, pumps, superheaters, ventilation of ships, the deviation of compasses due to the introduction of iron for shipbuilding, the relation between warship design and fundamental strategic and tactical problems, shallow-draft steamers, yachts and yacht-racing rules, ice-breakers, life boats and life-saving appliances, train-ferries and dredgers, rudders and steering problems, have all at one time or another found place among the topics dealt with in the published papers.

The above notes, while by no means exhausting the subjects discussed at the Meetings, show what a wide and useful field of investigation has been covered. It is always difficult to prove how far the facts elicited in the debates to which such questions gave rise have contributed towards their eventual settlement and solution, but it may safely be said that the great mass of information given in papers that have been read before the Institution has been of undoubted value to those upon whom rest the decisions that have to be taken when new modes of construction or propulsion are being evolved.

SCHOLARSHIPS ADMINISTERED BY THE INSTITUTION.

The scholarships in naval architecture and marine engineering which are administered by the Council of the Institution have increased largely of late years in number and value, and represent an important branch of the service rendered to the cause of applied science. The first of these scholarships was due to the liberality of the late B. Martell, Chief Ship Surveyor to Lloyd's Register, who in 1900 made over to the Council of the Institution a sum of money which had been subscribed as a testimonial to himself on his retirement. This sum was sufficient to endow a scholarship of the value of £50 per annum, tenable for three years at one of the universities or colleges where naval architecture is taught. This scholarship has been competed for at intervals of three years since 1901, and the successful candidates, who in most cases were Dockyard apprentices, have followed the course at the Royal Naval College, Greenwich. They have subsequently obtained satisfactory positions in their profession, some being still in Government service and others in private firms or practising on their own account as consulting naval architects. Martell's example was followed in 1906 by Yarrow, who endowed a similar scholarship, which he called the "Institution of Naval Architects Scholarship in Naval Architecture," and two years later, under the will of Elgar, to whose benefactions the Institution owes much, a sum of £1,600 became available for the endowment of a third scholarship on the same lines as those mentioned above; so that every year one such scholarship is competed for. Owing to the increase in the cost of living, the Council recognised that £50 per annum was an inadequate sum and, in 1913, this was increased to £100 per annum; in consequence of the War a further increase was subsequently sanctioned, and all three scholarships are now worth £130 per annum.

These scholarships are awarded on the results of the Board of Education examinations which are held annually at a large number of centres throughout the country. The papers set at these examinations, however, are chiefly technical, *i.e.* mathematics, applied mechanics, naval architecture etc., and it was felt that a wider field of candidates would be attracted if scholarships were available to be competed for on an examination of a university matriculation standard.

It was also desired that marine engineering should be provided for as well as naval architecture. Efforts were accordingly made, in 1918, to interest the shipbuilding and marine engineering firms in the subject, and a very good response has resulted. There are to-day, in addition to the scholarships already mentioned, fifteen scholarships, mostly of £150 per annum in value, tenable for three years, given by the firms whose names they bear, viz.: "Armstrong," "Beardmore," "Cammell Laird," "Denny," "Fairfield," "Hawthorn Leslie," "J. S. White," and "Vickers" in naval architecture, and "Parsons," "John Brown," "Denny," "R. L. Scott," "Richardson Westgarth," "Weir" and "Yarrow" in marine engineering.

It is still too early to judge of the success of these later scholarships by the subsequent careers of the holders, but, so far, all those who have won them have passed with credit through their university or college course, and have followed up their practical training during the summer months. As all the scholarships, save the "Parsons" and the "Yarrow," are unendowed, *i.e.* are dependent for their renewal upon the goodwill of the donors, it is very desirable that candidates should come forward in good numbers to compete for them, and that those to whom scholarships are awarded should prove by their subsequent careers that the object of the scholarships has been fully attained.

POST-GRADUATE RESEARCH SCHOLARSHIPS.

Another class of scholarships administered by the Institution are the post-graduate scholarships in naval architecture. In 1911, the Royal Commissioners for the 1851 Exhibition offered £200 per annum (subsequently increased to £250) for two years for a Research Scholarship in Naval Architecture to be awarded on the recommendation of the Council of the Institution of Naval Architects to whom nominations are submitted by the Universities of Glasgow and Liverpool, the Royal Naval College, and the Armstrong College, Newcastle-on-Tyne. This scholarship has already led to considerable original research being devoted to such questions as the rolling of ships and strength of ships, while the last holder of the scholarship was enabled to make a world tour, in the course of which he carried out and recorded investigations on the behaviour of ships at sea, and the facilities for docking and handling cargo which exist in some of the principal ports and harbours of the world.

A second post-graduate scholarship, bearing the honoured name of Sir William White, was founded in 1915 in memory of that great naval architect. The endowment for this scholarship, which is tenable by either shipbuilding or marine engineering students who have graduated, was placed at the disposal of the Council of the Institution of Civil Engineers, being the balance of a fund raised in memory of the late Sir William White.

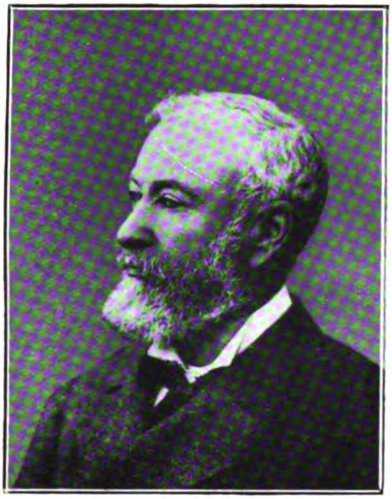
PRESIDENTS OF THE INSTITUTION.

No description of the Institution of Naval Architects would be complete without a brief reference to its distinguished Presidents. At the head of the list stands Sir John Pakington, afterwards Lord Hampton, the only President to occupy that post while serving as First Lord of the Admiralty. As First Lord in Lord Derby's brief administration of 1858, he had already been responsible for ordering the construction of H.M.S. Warrior, the first British sea-going iron armour-clad. Eight years later he was again called upon to serve in Lord Derby's Cabinet as First Lord of the Admiralty, which he did without resigning his office of President of the Institution. During the twenty years that he presided over its destinies, Lord Hampton only once failed to occupy the chair at the opening of the Annual Meetings. His wide experience and clearness of judgment admirably fitted him for the task, and his wise counsel and leadership helped to establish the Institution on a firm and lasting foundation.

Lord Ravensworth, who succeeded him in 1880, had, as the Hon. H. G. Liddell, represented South Northumberland for twenty-six years in the House of Commons. During that period he had frequently taken a prominent part in the debates on the various Merchant Shipping Amendment Acts, and had also served on the Royal Commission on Unseaworthy Ships, whose reports formed the basis of subsequent legislation. He thus brought with him a ripe knowledge of men and affairs and a keen interest in industrial questions, particularly those relating to shipping and shipbuilding matters.

He was succeeded, in 1893, by Lord Brassey, whose services to the Navy and to the nation are particularly familiar to readers of the "Annual"; if only as founder of that review, he might well claim to have earned his countrymen's gratitude. He was President of the Institution for three years, resigning to take up the post of Governor-General of Victoria, but his interest in the welfare of the Institution dated from its foundation, for he was one of the original Associates elected in 1860. On his return from Australia he continued to attend the Annual Meetings and to extend the pleasant hospitality of his house in Park Lane to the Members of the Institution.

The Earl of Hopetoun (afterwards Marquis of Linlithgow), who followed Lord Brassey, also possessed in a high degree those qualities of statesmanship combined with a singular charm of manner which made him an ideal President and leader. On two of the most noteworthy occasions in the history of the Institution—the first organised Meetings held in France and Germany in 1895 and 1896, respectively—Lord Hopetoun was able to cement the friendship between British shipbuilders and their confrères on the Continent. He resigned on being called to the high office of first Governor-General of the Australian Commonwealth, and was succeeded by the Earl of Glasgow, newly returned from the Governorship of New Zealand, who presided over the Institution from 1901 to 1908, and welcomed the Members at Kelburne, his beautiful home on the Clyde, when



THE EARL OF GLASGOW
(1901-1908).

LORD CAWDOR
(1908-1911).

THE MARQUIS OF BRISTOL
(1911-1916).

THE EARL OF DURHAM
(1916-1921).

FORMER PRESIDENTS OF THE INSTITUTION OF NAVAL ARCHITECTS.

the Institution visited Glasgow. Following him came Lord Cawdor, a former First Lord of the Admiralty, whose untimely death deprived the Institution of a distinguished President after a brief period of office.

The Marquis of Bristol was then invited to fill the vacancy. From his naval training and service he possessed a clear understanding of ships, their uses and limitations. One of his first duties was to preside over the memorable Jubilee Meetings of 1911, when a Royal Charter of Incorporation was granted by the Privy Council, and the brilliant International Congress, already referred to, was held in London to celebrate the fiftieth anniversary of the foundation of the Institution.

At the close of the five years period of office, which had become the established custom, the Earl of Durham was elected President, a choice which the five ensuing years showed to have been a fortunate one for the Institution. But this period was unhappily marred by the great trials and sorrows of the War. Notwithstanding all the difficulties and anxieties of that time, the Annual Meetings still continued to be held, and the flow and interchange of useful knowledge never ceased. The wisdom of carrying on and helping to forward the progress and development of the science of naval architecture was fully vindicated.

In 1921 a fresh choice of President had to be made, and, at the invitation of the Council, the Duke of Northumberland consented to take office. It has already been stated that an earlier Duke of Northumberland was invited in 1860 to become the first President of the Institution, but owing to ill-health was unable to accept, and the Institution is now fortunate in having a member of that distinguished family to preside at the present time.

CONCLUSION.

It may fairly be claimed that during the past sixty-three years the Institution has faithfully carried out the objects which its founders had in view. It has brought together on numberless occasions those who, in various branches of their profession and in many walks of life, are concerned with the progress of naval architecture, of ships, naval and mercantile, their engines and accessories. In giving free scope to discussion of designs and future developments, in testing the merits of new inventions through the results of experimental data, in gathering opinions from all parts of the world through the foreign and overseas Members of the Institution, and in cementing bonds with other countries by bringing these Members together at the Annual and Summer Meetings, the Institution may well claim to have played a useful part in furthering the development on scientific and practical lines of that industry upon which the welfare of all maritime nations depends, and with which is so intimately bound up the greatness and security of the British Empire.

R. W. DANA.

CHAPTER XI.

SIR JULIAN CORBETT: NAVAL HISTORIAN.

On September 21, 1922, Sir Julian Corbett died suddenly at Manor Farm, Stopham. He was at the height of his fame and his mental powers were undiminished. When he died, his wife and two children, whose presence was always quite indispensable to him, were with him; and there were objects near by which had often inspired his thoughts. He was not of those who distinguished between maritime and rural England; for he loved the country with its woods and pasture lands as much as the cliffs of Dover or the rocks of Cornwall; and from his study window at Manor Farm his eyes commanded the wide, green prospect of the Arun Valley. It was a sight well calculated to give a thoughtful man's reflections a backward turn: the sleepy meadows which stretch for miles from Stopham towards Amberley and Storrington are dotted with clumps of oaks and firs, such as supplied the Royal dockyards of an earlier age; and the old farmhouse in which he died was perfumed in memories. Its panelled dining-room; its enormous fireplaces; its great timbers, hidden in grey Sussex stone; its mullioned windows, and its old yew hedge all spoke of the past which he had seen with such visionary clearness.

Everything around him testified to his work. On his desk lay the last chapters of the third volume of the "Official Naval History"; behind it was a bookshelf containing a complete set of his own more important books, and a few dozen reference works. Those who knew him received the news with dismay and sorrow. He had imparted his knowledge, his advice and his encouragement to all who asked for it with a seigneurial generosity. His courtesy and goodness to his staff had never faltered.

THE BATTLE OF JUTLAND.

The news of his death aroused far more than merely personal feelings. For several days his friends were pressed with anxious inquiries from many who had known him only through his work. The question asked never varied: how much of the "Official Naval History" had he written? Had he completed his account of the Battle of Jutland? At every reading-desk in England where naval history is studied it was realised how much depended on having that great event recorded by his pen.

He had not gained this wide recognition rapidly; for the highest quality in his work is that it is insinuating and persuasive rather than arresting. His enormous reading had served him as an incentive; it had attached him to no school of historical thought; and his work owed little or nothing to those authors whom he most admired.

It was only after devoting years of thoughtful study to our naval and military records that he decided to write history; and, when he did so, he knew what lesson he wished to convey. He was, by then, persuaded that contemporary naval opinion was being unduly influenced by continental theories of war. It was by no means proved that the fundamental doctrines of war on land were applicable to war at sea; the rules for winning battles were not necessarily the best rules for conducting war; and, in any case, Great Britain's military power had a character of its own, and demanded special treatment. Finally, although specialisation in historical writing was inevitable, the historian of one aspect of human affairs, or of one group of human institutions, must never set up an immovable boundary line around his subject. A record of naval and military campaigns, separated from the politics, the public law and the current opinions of the periods in which they took place, could never be historical. To be properly treated, the special subject must be emphasised; but not isolated.

It took a long time before naval officers grasped the full significance of "England in the Seven Years War," or understood the penetrating criticism of the "Campaign of Trafalgar," but in the end they did grasp it; and his desk was full of letters which testified to the convictions which he had planted. Lord Fisher had expressed himself in terms of generous admiration; and Admiral Richmond, the friend who perhaps had most completely assimilated the teaching, was in charge of the War College at Greenwich.

THE SOURCE OF HIS POWER.

What, then, was the source of this singular power of persuading and convincing? How was it that a man, with the special training of a Chancery barrister, came to be recognised as a teacher in the science of naval war? The answer is to be found more in his character and way of life than in his style and command of logic. Those who read "Drake and the Tudor Navy," or the "Successors of Drake," or "England in the Mediterranean," with comprehension cannot fail to be impressed by an outstanding feature. The author's fairness is the natural urbanity of a polished gentleman; it springs from a courteous habit of thought which extends to the dead as well as to the living. His equanimity is that of a man to whom the past is a banqueting hall, filled with distinguished company. You may hear in it opinions contrary to your own; discussion must not go beyond the limits of a strict conversational decorum. It would be an unthinkable breach of good manners to attack an unsuccessful commander or a foolish statesman in whose company you are drinking wine; and the same rule applies in presenting points with which the table is in agreement. Heated, vociferative conviction is out of place; the matter must be stated with dignity and calmness.

The Courteous Historian.

Sir Julian Corbett was not indifferent to faults of policy, whose consequences are long forgotten ; nor could he survey the history of a mismanaged campaign with anything but bitter regret; but whatever feelings the one or the other aroused, he wrote as though the chief actors were entitled to the scrupulous courtesy which he extended to all around him. Two instances will suffice. Historians of the greatest impartiality have treated the Duke of Newcastle as a buffoon : Sir Julian could never bring himself to be so hasty. By well-judged doses of corruption, cajolery and persuasion, the duke had made the incoherent, factious parliament of his day a workable instrument of war. The achievement of directing the vanity and weakness of those around him to a useful impulse in public affairs implied great wisdom: Pitt's system of war was inseparable from Newcastle's system of parliamentary government, and the duke was entitled to all the respect which practical sagacity commands. Even when Sir Julian's criticism was most destructive, when he tore Napoleon's ill-conceived plan of the Trafalgar campaign to shreds, he never for a moment forgot that he was dealing with the projects of a great man. It was the principle of attempting to apply the strategy of Austerlitz and Jena to the blue water which provoked his censure: the mind which strove to square the strategical circle was still great and imposing.

This method of treating the past gave his work a peculiar flavour; and was at the root of its success. It combined the worldly wisdom of an ambassador's despatch with the learning of a great scholar. It was intended, primarily, to make practical men, engrossed in the details of naval policy and administration, more thoughtful; but it was intended, also, to make their reflections easy. The famous tutor of the Dauphin of France, who said that a teacher could incur no greater reproach than that of setting a hard lesson, would have claimed Sir Julian as an apt pupil.

The Official History of the Naval War.

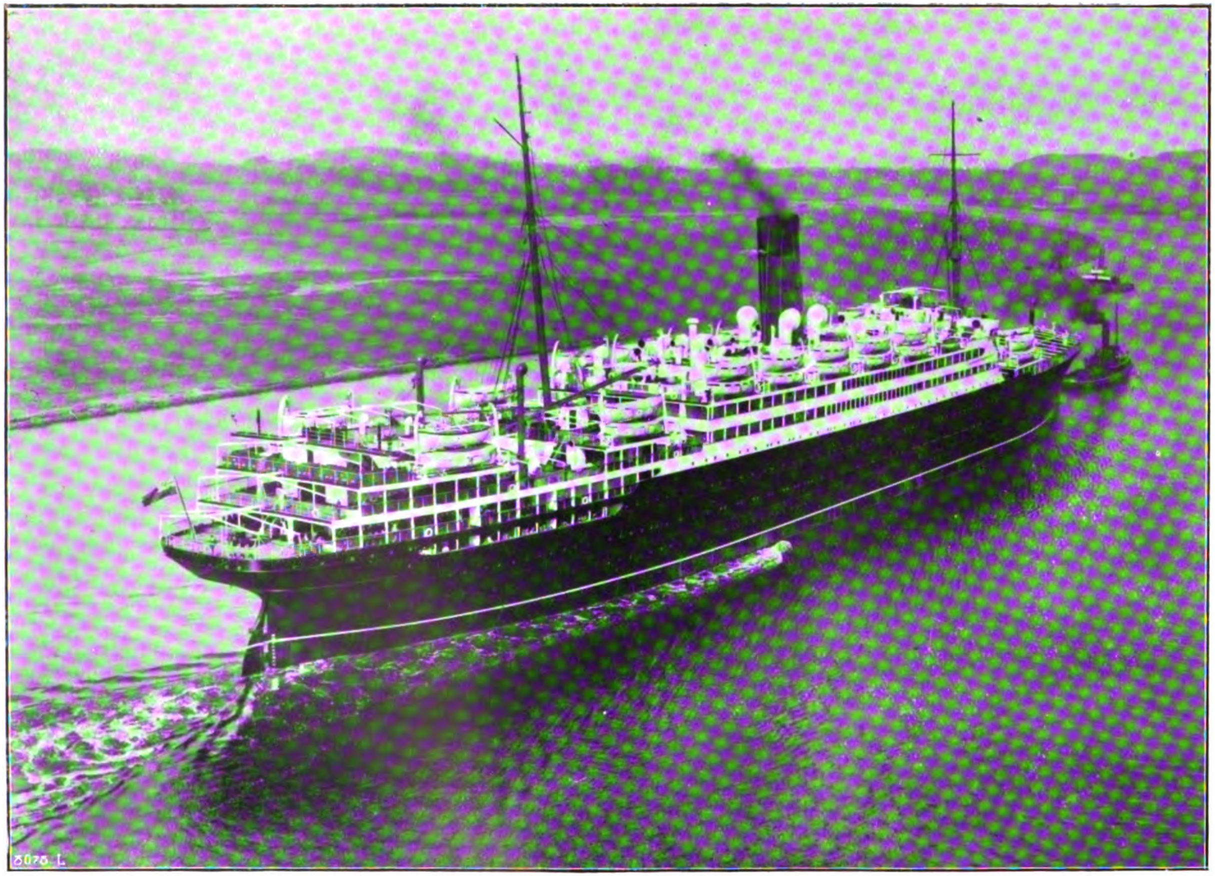
In 1914, Sir Julian Corbett had just completed a confidential study of the maritime operations of the Russo-Japanese war. He intended to continue his study of past campaigns, and contemplated a history of the naval war against the Napoleonic coalition after Trafalgar; but August 1914 turned his energies into another channel. The Government realised, almost immediately, that an official record of the war would have to be issued; and Sir Julian Corbett was asked to write a history of the naval operations. He was given access to all the necessary documents, political and naval; and he was appointed to the Committee of Imperial Defence, a position which made him independent of the two great military departments of State.

The task was one of extraordinary difficulty. The matter had to be presented with complete truthfulness; but, it could not be supposed that the historian of Coronel, the Falklands, the Dogger

Bank and Jutland, would be able to handle his subject with the freedom which is permissible to those who treat of events in bygone centuries. How could absolute candour be combined with the reticence demanded of a historian whose words may affect the reputation of men still living? Sir Julian's solution does him the highest honour. All that was necessary was self-restraint. No relevant fact was to be suppressed; events were to be so recorded that their inner meaning and consequences were to be clear to all; but the direct personal intervention of the author must be studiously avoided. When death overtook him, two volumes of the work had appeared; the third, with his account of the Battle of Jutland, was still in type script. He did not survive to hear the last echo of the applause which his achievement had excited; but he knew that he had presented the nation with an account of all that it is so vital to them to know, without ever departing from the rule which his own high code of loyalty and honour had commanded him to observe.

THE EDITORS.

MERCHANT SHIPPING SECTION.



THE WORLD-TOURING CUNARD LINER FRANCONIA.

(Constructed by Messrs. John Brown & Co., Ltd., Clydebank.)

CHAPTER I.

THE WORLD'S MERCANTILE MARINE.

THE course of events during the year 1923 has emphasised the fact that the conditions under which sea trade is carried on must in the future be far different from those existing before the war; and though a return to a fair measure of stability may eventually be seen, yet that time is far distant, and each month that separates us from the World War serves to reveal more clearly the extent of the problems which still await solution.

Towards the end of the year 1922, many optimistic statements were made to the effect that the long-looked-for revival in shipping would come to pass in 1923. Those statements, however, have not been justified to any appreciable extent, and the present year has been largely one of painful readjustment to changed conditions. In previous chapters written for the "Annual," the writer pointed out the main causes of this state of affairs. Briefly, they are:—

(*a*) The vast efforts made by the Allies (and, in particular, America) to defeat the German submarine campaign; the very success of those efforts was the measure of their unsettling influence on post-war shipping conditions.

(*b*) The great increase of the nationalist spirit, particularly among maritime countries, and the consequent desire to use the greatly increased shipbuilding capacity of each country as a means for the establishment of national mercantile marines, without regard to the economic conditions which inevitably regulate the size of such fleets.

(*c*) The artificial situation created by the Treaty of Versailles, whereby the entire "over-seas" portion of the German fleet of merchant vessels was confiscated.

(*d*) The after-effects of currency inflation the world over, which resulted in a decrease of world trade to, at the best, about three-quarters of its pre-war volume.

It must be emphasised that the world's mercantile fleet came into being in response to the demand for the transportation of goods and for travel, and that as this demand varies, so does the amount of shipping in operation; in short, shipping is just as much a commodity as timber or money, and its price in the world's markets varies with the demand. It is an axiom of commerce that any artificial attempt to sustain prices in the face of decreased demand is doomed to failure. And, similarly, it may be said that should a country, in the attempt to require its whole trade to be carried in its own ships, set up barriers to free international trading, these barriers must, sooner or later, be removed, in the interests of that country itself.

It is also to be observed that while, on the one hand, the capacity of the shipbuilding yards of the world had increased by the end of the war to approximately 2½ times the pre-war figure, the fleet required had decreased considerably, and, since the fleet *in existence* was larger by about 10 million tons than the pre-war mercantile marine, it followed that, other things being equal, a period of grave depression in the shipbuilding industry was inevitable.

It follows, then, that a short-sighted and nationalist policy must not only fail of its purpose, but must also react unfavourably upon the economic position of the country concerned, and delay the return of its shipbuilding industry to normal conditions.

POST-WAR ECONOMIC POSITION.

It may therefore be of interest to refer to a table, printed in last year's "Annual," giving particulars of the index numbers of the course of wholesale prices in various countries. While this table gave a broad picture of the economic changes which have taken place as a result of the war, it was not on a strictly comparable basis, since it took no account of the great differences which now exist in the purchasing power of currency, as between one country and another. It has now been possible to present in Table I., a list of wholesale price indexes for the principal maritime countries, which has been corrected for changes in the value of currency. The average level of the wholesale prices of general commodities in the United Kingdom for the year 1913 has been taken as 100, and the wholesale price indexes of the other countries first brought to the same base year and then corrected by the average exchange rates for the year in question.

TABLE I.—THE YEARLY AVERAGE COURSE OF WHOLESALE PRICES IN VARIOUS COUNTRIES.

(Corrected for changes in the value of currency as compared with the English sovereign, *i.e.* prices expressed in pounds sterling.)

Year.	United Kingdom.	United States.	France.	Japan.	Germany.	Sweden.	Holland.	Italy.
1895	73	68·4	72·9	—	70·2	—	—	71·0
1900	88	79·8	82·2	75·2	85·9	—	—	74·2
1905	85	85·9	85·1	87·2	80·1	—	—	82·2
1910	92	96·9	92·9	90·4	88·8	—	—	86·5
1913	100	99·8	99·8	99·4	99·8	99·2	99·6	98·2
1915	127	102·5	133·4	96·1	—	—	149·6	116·6
1920	295	171·2	243·3	334·1	141·8	366·0	318·6	208·5
1922	154	163·8	150·4	205·3	376·0	185·7	168·1	151·8

Broadly speaking, it may be said that this table shows that whereas a certain quantity of general goods cost in England in 1913 the sum of £100 at wholesale prices, the same quantity of goods could be purchased in that year for 99·8 *pounds sterling* in Germany, and in 1922 for 376·0 *pounds sterling* in the same country.

It will be seen from the table that before the war the differences between the countries represented were really slight, and that in the year 1913 the maximum difference between any of the countries shown was only 1·8 per cent. On the other hand, during 1922 sterling costs were only lower than the United Kingdom figure in France and Italy, and it is to be observed that in spite of the correction for the fluctuations of the mark, the cost of wholesale goods in Germany during 1922 was, on the average, two and a half times the figure for this country.

It should also be noted that the variations for 1920 were greatly reduced by the year 1922, with the one exception of Germany, thus showing that there is a strong tendency to return to the pre-war stability as between one country and another, although the general level of prices is still maintained at a high figure.

TABLE II.—SEAGOING STEEL AND IRON STEAM AND MOTOR TONNAGE OWNED BY THE PRINCIPAL MARITIME COUNTRIES.

(Thousands of gross tons, *i.e.* 000's omitted.)

Country.	As at June, 1914.	As at June, 1921.	As at June, 1922.	As at June, 1923.
United Kingdom	18,877	19,288	19,053	19,077
British Dominions	1,407	1,950	2,201	2,219
America (United States)	1,837	12,314	12,506	12,467
Austria-Hungary	1,052	Nil.	Nil.	Nil.
Denmark	768	866	944	920
France	1,918	3,046	3,303	3,265
Germany	5,098	654	1,783	2,496
Greece	820	576	653	743
Holland	1,471	2,207	2,613	2,606
Italy	1,428	2,378	2,600	2,788
Japan	1,642	3,063	3,325	3,402
Norway	1,923	2,285	2,337	2,299
Spain	883	1,094	1,187	1,169
Sweden	992	1,037	996	1,092
Other Countries	2,398	3,459	3,301	3,396
Total Abroad	23,637	34,929	37,749	38,862
World's Total	42,514	54,217	56,802	57,939

This table does not include Canadian and American lake vessels.

Since wholesale prices are largely dependent upon transport facilities, it follows that, in a broad sense, the above movements must to some extent affect the distribution of the world's mercantile marine.

THE DISTRIBUTION OF TONNAGE.

It will be well, then, to examine the statistics of the effective portion of the world's fleets, and to see in what way the distribution has changed, or is changing. Table II. gives the amount of seagoing steel and iron steam and motor tonnage owned by the principal maritime countries of the world, both before and since the war. Sailing vessels are not shown, since they now only amount to about 4 per cent. of the gross total of the world's fleets.

The main items of interest in these figures are, of course, the great increase in the tonnage owned in America since pre-war days, and the rapid recovery of Germany from the artificial position created by the Treaty of Versailles. To have replaced almost one-half of the surrendered tonnage in four years is a wonderful achievement, and is one of the chief arguments of those who hold that Germany is capable of paying the reparation demands imposed upon her by the Allies.

The changes which have taken place since pre-war days are still more clearly shown by reference to Table III., which shows the successive differences in the seagoing steel and iron steam and motor tonnage owned in the various countries in 1914, 1921, 1922, and 1923:—

TABLE III.—DIFFERENCES IN SEAGOING STEEL AND IRON STEAM AND MOTOR TONNAGE OWNED BY THE PRINCIPAL MARITIME COUNTRIES IN VARIOUS YEARS.

(Thousands of gross tons, *i.e.* 000's omitted.)

Country.	Differences.*			
	June, 1914, and June, 1921.	June, 1914, and June, 1923.	June, 1921, and June, 1922.	June, 1922, and June, 1923.
United Kingdom	411	200	—235	24
British Dominions	543	812	251	18
America (United States)	10,477	10,630	192	–39
Denmark	98	152	78	–24
France	1,128	1,347	257	–38
Germany	–4,444	—2,602	1,129	713
Greece	—244	—77	77	90
Holland	736	1,135	406	–7
Italy	950	1,360	222	188
Japan	1,421	1,760	262	77
Norway	362	376	52	–38
Spain	211	286	93	–18
Sweden	45	100	—41	96
Other Countries	1,061	998	—158	95
Total Abroad	11,292	15,225	2,820	1,113
World's Total	11,703	15,425	2,585	1,137

* The figures given represent increases except where preceded by a minus sign.

The increase of nearly three-quarters of a million tons in Germany during the last year is to be noted, as is also the decrease of 39,000 tons in American tonnage. It is also to be pointed out that several of the countries which extended their fleets after the war are not now maintaining that increase.

Table IV., on the opposite page, shows the percentage of the world's total fleet of seagoing steel and iron steam and motor tonnage owned by the various countries. The rise of Germany from 1·2 per cent. in

1921 to 4·3 per cent. in 1923 is significant, as is the slight but steady increase in the percentage of tonnage owned abroad, as compared with the United Kingdom.

In last year's "Annual" the writer commented on the slight drop in the percentage owned in the United States, and pointed out that the rise from 4·3 per cent. in 1914 to 22·7 per cent. in 1921 was economically unsound, and presaged a period of stagnation, if not of actual decline. It will be seen that there has been a further slight drop in the percentage for 1923, in spite of the efforts still made in America to maintain a national mercantile marine.

TABLE IV.—PERCENTAGE OF THE WORLD'S TOTAL STEEL AND IRON SEAGOING STEAM AND MOTOR TONNAGE OWNED BY THE PRINCIPAL MARITIME COUNTRIES.

Country.	As at June, 1914.	As at June, 1921.	As at June, 1922.	As at June, 1923.
United Kingdom	44·4	35·6	33·5	32·9
British Dominions	3·3	3·6	3·9	3·8
British Empire	47·7	39·2	37·4	36·7
United States	4·3	22·7	22·0	21·5
Austria-Hungary	2·5	Nil.	Nil.	Nil.
Denmark	1·8	1·7	1·7	1·6
France	4·5	5·6	5·8	5·6
Germany	12·0	1·2	3·1	4·3
Greece	1·9	1·1	1·2	1·3
Holland	3·5	4·1	4·6	4·5
Italy	3·4	4·4	4·6	4·8
Japan	3·9	5·6	5·9	5·9
Norway	4·5	4·2	4·1	4·0
Spain	2·1	2·0	2·1	2·0
Sweden	2·3	1·9	1·7	1·9
Other Countries	5·6	6·3	5·8	5·9
Total Abroad . .	55·6	64·4	66·5	67·1
	100·0	100·0	100·0	100·0

SHIPPING IN AMERICA.

Three years ago* the writer gave a description of the unparalleled shipbuilding effort undertaken by the United States during and at the close of the war, and paid tribute to the whole-hearted response to the Allied needs. Unfortunately, however, the programme of shipbuilding undertaken to defeat the submarine campaign was only just reaching its full output when the Armistice put a sudden end to the losses due to the U-boat; consequently, instead of being, as it was, one of the principal factors upon which victory depended, America's wartime shipbuilding became at once a most serious unsettling force in world shipping. The Allies' shipbuilding efforts, if not actually successful in overcoming the submarine attack, had greatly minimised its effect as regards the amount of tonnage available; the Armistice released numerous vessels which had been commandeered or chartered for naval purposes; the return of troops from various theatres of war added to this number; and the world, which had suffered from a most serious shortage of mercantile tonnage, found itself with a sudden and overwhelming *surplus* of tonnage, while the American programme of construction still went on.

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* "Brassey's Naval and Shipping Annual" for 1920–21.

In America, too, as in other countries, the war had brought in its train a great increase in the nationalist spirit, and up to a very short time ago, the American Government was endeavouring in every possible way to maintain a State-owned or State-aided fleet of merchant vessels, regardless of the fact that while vast stretches of the interior of the American continent are undeveloped, only a small percentage of the population of the seaboard will have any great or vital interest in shipping affairs. Despite the teaching of economic history, an attempt was made to subsidise the merchant fleet to an extent never before contemplated by any modern Government. The sweeping nature of the proposals, which were outlined in the "Annual" for 1922–23, aroused considerable opposition on the part of commercial and political interests in the United States, and early this year the Bill was at last withdrawn.

The withdrawal of the Shipping Subsidy Bill, however, only increases the embarrassment of those responsible for America's shipping. Out of a total of 12½ million tons of seagoing steam and motor tonnage, of which a large proportion is privately owned, no less than 5 million gross tons was laid up at the beginning of 1923, as compared with under three-quarters of a million tons in the United Kingdom. The problem of surplus tonnage, which was faced by European maritime countries after the Armistice, has now, five years later, to be faced by America at a time when the shipping industry is still in the grip of a world-wide depression. Where can purchasers be found? Shipowners in this country have had to bear the burden of the surrendered German tonnage, and of this country's standard ship construction programme. The various other countries which increased their fleets at the bidding of the nationalist spirit have their own problems to deal with.

LATEST AMERICAN PROPOSALS.

It is not surprising, in these circumstances, that attempts are still being made in America to operate the fleet. Mr. Albert D. Lasker, the retiring Chairman of the United States Shipping Board, wrote a letter in June last to the late President Harding, advising the formation of eighteen Government Corporations to take over the present Government steamship routes. To these Corporations he suggested that 250 steel vessels should be assigned, and that an additional 200 should be "set aside as a reserve." The remaining Government merchant ships, which amount to no less than 1,050 vessels, should be "scrapped," "thus ridding the shipping business of a disturbing influence." While this suggestion would no doubt do something to mitigate the evils arising from the existence of the present surplus, yet, in the present disturbed state of the freight market, the proposed "reserve" of 200 ships would be sufficient in itself to prevent any permanent recovery of freights. A slight recovery would be immediately followed by the taking of some of the "reserve" into operation, and freights would therefore drop once more. Out of the present fleet of 12½ million tons, only 7½ million tons are usefully employed; assuming the 200 vessels referred to by Mr. Lasker aggregate roughly one million gross tons, an increase of over 13 per cent. in the trade carried by American vessels would be necessary to absorb this "reserve."

Later, a more ingenious policy has been suggested, of selling the present Shipping Board fleet to American shipping firms at prices so far below the present market value of "ready" tonnage as to constitute, in effect, a subsidy. American ship operators at present claim to be handicapped owing to the fact that wages and subsistence costs are alike lower elsewhere than in America. If vessels are sold to American shipping interests at, say, half their market price, the effect would be a saving on interest, insurance, and depreciation of roughly 50 per cent., or say 10 per cent. of the operating costs. Since operating costs for a 6,000 gross ton cargo steamer are in the neighbourhood of £3,000 per month, and the difference between, for instance, the British scale of wages for a vessel of this class and the scale for a similar American vessel is, roughly, £125 per month, the effect of such a policy would be not only to remove the alleged disability under which the American shipping firms are at present suffering, but to give an additional subsidy amounting to some six per cent. of the operating costs. This suggested policy, however, would not deal with the idle tonnage, and the opinion is very generally expressed that, in the end, America must needs "write off" practically the whole of her war-built tonnage as useless.

On the other hand, however, while America as a whole would not agree to the Ship Subsidy Bill, she is apparently determined that a large mercantile marine is a necessary part of the equipment of any first-class Power, and is therefore prepared in her annual Budget to allocate expenditure towards the deficit created by Government operation of merchant vessels, in the same way as sanction is given for the cost of the Army, Navy, and so forth. If this policy prevails for any length of time, the recovery of freights from their present extremely low level will be slow, even in the face of increased trade, and shipbuilding, both in America and elsewhere, will be handicapped by the fact that orders will, in the main, be confined to urgent requirements for vessels for special trades.

THE RECOVERY OF GERMANY.

By the Treaty of Versailles, Germany was required to surrender nearly four and a half million tons of ocean-going merchant shipping, and was, further, to build a certain amount of new tonnage for the Allied merchant fleets, if such was required, as part of the reparations demand. This policy was apparently an attempt to "make Germany pay" for the submarine campaign; but unfortunately the Treaty-makers lost sight of the fact that the shipbuilding capacity of the Allied and neutral countries had been increased to an aggregate of two and a half times the pre-war figure, and already the effect of the losses due to submarines had been largely neutralised. The immediate effect of the placing of the ex-German vessels on the world's market was a spectacular slump in the value of tonnage; the surrendered tonnage allocated to the various Allied countries could not be absorbed by the shipping industry, and in many cases the vessels were in the end bought in by their original German owners, at a very low figure. The price of new vessels in this country, which reached a "peak" of over £34 a ton (for ordinary cargo vessels) at the beginning of 1920, fell in a single year to roughly £11 per ton, and now stands at about £8. The Allied option to have new merchant vessels built in German yards has never been exercised.

TABLE V.—PERCENTAGE OF THE FLEETS OF THE PRINCIPAL MARITIME COUNTRIES WHICH IS UNDER FIVE YEARS OF AGE.

Steam and Motor Tonnage only. Figures as at June, 1923.

Country.	Gross Tonnage owned.	Percentage under Five Years of Age.
Great Britain and Ireland	19,115,178	29
British Dominions	2,579,896	38
United States	13,426,221	58
Belgium	605,050	26
Brazil	459,416	1
Denmark	937,743	33
France	3,452,940	35
Germany	2,509,768	53
Greece	747,474	18
Holland	2,607,210	38
Italy	2,880,776	28
Japan	3,604,147	35
Norway	2,375,970	33
Spain	1,198,716	27
Sweden	1,135,612	25
Other Countries	2,502,248	13
World's Total *	60,138,365	36

* Excluding United States lake vessels.

On the other hand, events have shown that Germany was determined to resume her old place in the merchant shipping of the world. In June, 1914, the German merchant fleet amounted to roughly five and a half million gross tons; by June, 1920, this had been reduced, owing to the Treaty, to 673,000 tons. Yet by June, 1922, the German fleet had increased again to 1,887,000 gross tons, and in June of this year was over two and a half million tons, despite the increasing difficulties of her financial position. Her shipbuilding industry, too, is in a unique position. Whereas the shipbuilding output of the world for 1922 was approximately two-thirds of the figure for 1913, Germany built in 1922 nearly one and a half times the amount she produced in 1913. In 1913 she was responsible for roughly 14 per cent. of the world's shipbuilding; in 1922 the figure had increased to over 23 per cent.

Furthermore, the tonnage owned by Germany is fully employed; whereas a large proportion of the world's merchant fleet has been laid up, no appreciable quantity of German tonnage has been idle until the occupation of the Ruhr rendered most of the Rhine transport idle. Even to-day, with 75 per cent. of the Rhine transport (tugs and barges) laid up in Rotterdam, the great majority of the over-seas fleet is still usefully at work. Markets formerly controlled by Germany have been recaptured, and the German shipping interests are making strong efforts to extend their operations to other sea routes.

While, of course, it would be easy to point to the phenomenal dividends paid during the last two or three years by German shipping companies, it must not be forgotten that the constant and rapid depreciation of the mark is responsible for such figures, to a large extent. But, at the same time, Germany has a new fleet, and is prepared to expend a large amount of the profits of her shipbuilding and shipping industries on improvements and extensions of plant.

TABLE VI.—THE WORLD'S SHIPBUILDING, IN MILLIONS OF GROSS TONS.

Country.	1913.	1919.	1920.	1921.	1922.
United Kingdom . .	1·932	1·620	2·056	1·538	1·031
British Dominions *. .	0·027	0·298	0·174	0·118	0·053
British Empire . . .	1·959	1·918	2·230	1·656	1·084
Germany	0·465	?	?	0·509	0·575
United States † . . .	0·228	3·040	2·349	0·995	0·097
France	0·176	0·033	0·093	0·211	0·185
Holland	0·104	0·137	0·183	0·232	0·163
Japan	0·064	0·612	0·457	0·227	0·083
Austria-Hungary . . .	0·062	Nil.	Nil.	Nil.	Nil.
Italy ‡	0·050	0·083	0·133	0·165	0·101
Scandinavia	0·110	0·147	0·164	0 195	0·103
Other Countries . . .	0·043	0·079	0·096	0·129	0·043
World's Total † . .	3·261	6·049 §	5·705 §	4·319	2·434

* Excludes Canadian Great Lakes vessels.
† Excludes wooden vessels, and American Great Lakes tonnage.
‡ Italy now includes Trieste.
§ Excludes Germany.

Table V., on page 212, may be of interest as showing the comparative age of the German fleet.

It will be observed that 53 per cent. of the German fleet is under five years of age. The only country rivalling this proportion is the United States—which has over four and a half million gross tons of shipping laid up. Excluding Germany and the United States, the proportion of the world's merchant fleet of steam and motor vessels which is under five years of age is 28 per cent. It will readily be seen what advantage accrues to Germany by the comparative newness of her vessels.

THE WORLD'S SHIPBUILDING.

Table VI., on page 213, gives the gross tonnage of vessels of 100 tons and upwards launched in the principal maritime countries of the world, as reported to Lloyd's Register of Shipping. It will be seen that the fears expressed in last year's "Annual" have been amply confirmed, and that the world's output of new tonnage for the year 1922 is considerably less than the pre-war figure.

The outstanding feature of this table is the decline of the United States to 97,000 tons—nearly a million tons less than the 1921 figure, and only *three per cent.* of the 1919 output, even when allowance has been made for the half-million gross tons of wooden vessels included in the gross figure of 3,579,826 tons for the latter year.

TABLE VII.—THE PERCENTAGE OF THE WORLD'S TOTAL AMOUNT OF TONNAGE BUILT IN THE PRINCIPAL SHIPBUILDING COUNTRIES.

(See footnotes to Table VI. on p. 213.)

Country.	1913.	1919.	1920.	1921.	1922.
United Kingdom	59·2	26·8	36·0	35·7	42·3
British Dominions	0·8	4·9	3·1	2·7	2·2
British Empire	60·0	31·7	39·1	38·4	44·5
Germany	14·3	?	?	11·8	23·6
United States	7·0	50·3	41·2	23·0	4·0
France	5·4	0·5	1·6	4·9	7·6
Holland	3·2	2·3	3·2	5·4	6·7
Japan	2·0	10·1	8·0	5·2	3·4
Austria-Hungary	1·9	—	—	—	—
Italy	1·5	1·4	2·3	3·8	4·2
Scandinavia	3·4	2·4	2·9	4·5	4·3
Other Countries	1·3	1·3	1·7	3·0	1·7
	100·0	100·0	100·0	100·0	100·0

Comment has already been made on the recovery of Germany. It will be observed that there is a strong tendency on the part of most other countries in the world to return approximately to the pre-war position.

In Table VII. will be seen the distribution of the world's shipbuilding, expressed in percentage terms. The recovery of the United Kingdom from 35·7 per cent. in 1921 to 42·3 per cent. in 1922 is a very encouraging sign. The year 1922 was probably the worst "slump" period the industry has ever experienced, and British shipbuilding yards had to contend against high wages, high costs, and other factors which tended to send contracts abroad. In this connection it is well to note that the figures for Holland show a gradual and steady increase since the war; and it is to be anticipated that Holland's shipbuilding position will be permanently above the pre-war level.

The very great drop of America from 50 per cent. in 1919 to only 4 per cent. in 1922 is again to be noticed.

THE PROGRESS OF THE SLUMP.

It seems desirable to give some other basic figures by which the prosperity of the industry can be gauged, *i.e.* the quarterly figures, issued by Lloyd's Register of Shipping, of the tonnage under construction throughout the world. The annual figures of output, as yet, show no signs of actual recovery, and it is only by intelligent study of the quarterly figures that the possibility of a return to more normal conditions can be estimated.

TABLE VIII.—SHIPBUILDING, IN MILLIONS OF GROSS TONS.*

(See also Tables IX. and X.)

Quarter ended.	United Kingdom.			Other Countries.			Total.		
	Under construction.	Commenced.	Launched.	Under construction.	Commenced.	Launched.	Under construction.	Commenced.	Launched.
Sept. 30, 1919	2·317	—	0·614	5·232	—	1·371	8·049	—	1·787
Dec. 31, 1919	2·994	0·604	0·459	4·867	1·150	1·582	7·861	1·754	2·041
Mar. 31, 1920	3·394	0·708	0·454	4·548	1·000	0·882	7·942	1·708	1·336
June 30, 1920	3·578	0·588	0·523	4·143	0·796	1·022	7·721	1·384	1·545
Sept. 30, 1920	3·731	0·594	0·483	3·834	0·788	1·005	7·565	1·382	1·488
Dec. 31, 1920	3·709	0·506	0·580	3·471	0·720	0·897	7·180	1·226	1·477
Mar. 31, 1921	3·799	0·393	0·433	3·288	0·462	0·622	7·087	0·855	1·055
June 30, 1921	3·530	0·069	0·321	2·669	0·178	0·686	6·199	0·247	1·007
Sept. 30, 1921	3·283	0·051	0·308	2·260	0·265	0·539	5·543	0·316	0·847
Dec. 31, 1921	2·640	0·055	0·467	1·817	0·091	0·428	4·457	0·146	0·895
Mar. 31, 1922	2·236	0·051	0·304	1·444	0·067	0·189	3·680	0·118	0·523
June 30, 1922	1·919	0·039	0·149	1·316	0·112	0·241	3·235	0·151	0·390
Sept. 30, 1922	1·617	0·082	0·307	1·086	0·106	0·169	2·703	0·188	0·476
Dec. 31, 1922	1·468	0·213	0·261	1·022	0·114	0·181	2·490	0·345	0·442
Mar. 31, 1923	1·492	0·355	0·228	1·025	0·176	0·145	2·517	0·531	0·373
June 30, 1923	1·338	0·241	0·239	0·854	0·073	0·171	2·192	0·314	0·410

* Excluding tonnage in Danzig and Germany. See Table IX.

TABLE IX.—TONNAGE UNDER CONSTRUCTION, AND LAUNCHED, IN GERMANY AND DANZIG.

Quarter ended.	Germany.		Danzig.	
	Under construction.	Launched.	Under construction.	Launched.
June 30, 1922 * . . .	500,000	150,000	45,000	?
Sept. 30, 1922 * . . .	350,000	100,000 †	40,000	†
Dec. 31, 1922	416,081	85,487	47,796	10,838
Mar. 31, 1923	333,427	68,862	9,600	1,600
June 30, 1923	301,199	118,292	51,206	41,773

* Estimated only. † Includes Danzig.

Table VIII. shows that while in the United Kingdom the gross amount of tonnage under construction and launched is yet at a very low level, the tonnage commenced has, for the period commencing July, 1922, shown a great increase, which has not, however, been shared to any very great extent by other countries.

The figures in Table VIII. do not include tonnage building in Germany or Danzig, and it is of interest to consider these separately, for the period during which figures are available; the figures are given in Table IX. on page 215.

Figures of tonnage commenced are not yet available. It will be seen that the last two quarters show a slight decline in the amount of tonnage under construction in Germany. It is possible that the financial difficulties through which that country is now passing will reflect adversely upon her shipbuilding industry, to a greater extent than has hitherto been the case.

The tonnage shown in Table VIII. as "under construction" unfortunately includes a certain proportion of vessels upon which construction has been suspended for longer or shorter periods. Naturally, this factor is one which very greatly militates against the quick return to normal conditions in the industry, and those interested in shipbuilding are closely watching the figures of "suspended" tonnage. Table X. shows the effect of suspensions upon the figures for tonnage "Under Construction":—

TABLE X.—SUSPENDED CONSTRUCTION.

(Millions of Gross Tons.)

Quarter ended.	United Kingdom.			Other Countries.			Total.		
	Under construction.	Suspended.	Actually under construction.	Under construction.	Suspended.	Actually under construction.	Under construction.	Suspended.	Actually under construction.
Mar. 31, 1921	3·799	0·497	3·302	3·288	*	3·288	7·087	0·497	6·590
June 30, 1921	3·530	0·735	2·795	2·669	*	2·669	6·199	0·735	5·464
Sept. 30, 1921	3·283	0·731	2·552	2·260	0·375	1·885	5·543	1·106	4·437
Dec. 31, 1921	2·640	0·722	1·918	1·817	0·400	1·417	4·457	1·122	3·335
Mar. 31, 1922	2·236	0·617	1·619	1·444	0·325	1·119	3·680	0·942	2·738
June 30, 1922	1·919	0·481	1·438	1·316	0·290	1·026	3·235	0·771	2·464
Sept. 30, 1922	1·617	0·419	1·198	1·086	0·256	0·830	2·703	0·675	2·028
Dec. 31, 1922	1·468	0·348	1·120	1·022	0·216	0·806	2·490	0·564	1·926
Mar. 31, 1923	1·492	0·181	1·311	1·025	0·148	0·877	2·517	0·329	2·188
June 30, 1923	1·338	0·130	1·208	0·854	0·132	0·722	2·192	0·262	1·930

* No figures available.

It will be observed that while the amount of "suspended" construction is still appreciable, yet there has been a sensible reduction during the last few quarters, and this is bound to react favourably upon the general shipbuilding position.

LAID UP TONNAGE.

In last year's "Annual" comment was made upon the large proportion of the world's fleet which has been laid up either temporarily or permanently during the slump, and it was pointed out that the extensive laying up of tonnage has a marked effect on the efficiency of the fleet as a whole, since depreciation proceeds much more rapidly when vessels are laid up than when they are employed. It is now possible to give, in Table XI., on this page, some more or less complete figures of the extent of this factor, in order that its importance may be gauged.

These figures are, of course, approximate only, and the total tonnage laid up in the world will probably be larger than the totals shown. Also, of course, the figures are of vessels laid up in the various ports of the countries named, and are irrespective of nationality.

No more striking evidence of the fact that America's shipbuilding programme at the end of the war was untimely could be found than the large amount of Government-owned laid-up tonnage included in the United States figure. The actual amounts are as follows:—

TABLE XI.—TONNAGE LAID UP IN THE PRINCIPAL MARITIME COUNTRIES OF THE WORLD.

(Millions of gross tons.)

Country.	January, 1922.	July, 1922.	January, 1923	July, 1923.
United Kingdom . . .	1·961	1·667	1·010	1·064
Australia	0·050	0·100	0·106	0·216
United States	5·309	4·715	5·328	4·575
France	1·085	1·200	0·730	0·725
Holland	0·327	0·330	0·330	0·250
Japan	0·120	0·079	0·099	0·036
Italy	0·585	0·585	0·472	0·559
Scandinavia	0·572	0·259	0·093	0·085
Greece	0·170	0·048	0·076	0·094
Belgium	0·275	0·275	0·275	0·200
Spain	0·530	0·530	0·520	0·241
Total . . .	10·984	9·788	9·039	7·345

	Millions of gross tons.
January, 1922	4·528
July, 1922	4·192
January, 1923	4·625
July, 1923	4·107

It will be observed that this large figure has been approximately maintained during the past year, in spite of the general reduction which has taken place.

INTERNATIONAL UNDERSTANDING.

In the last issue of the "Annual" attention was drawn to the great progress that had been made towards international understanding in maritime affairs, and it was shown that the world shipping industry had gradually realised that it would be possible to frame a standard of conduct which would be fair to all communities taking part in the international industry of sea trade. For a long time the political machinery of the various countries interested in maritime affairs was used to further this ideal. A good deal of work was done by the International Law Association and the Comité Maritime International, mainly in connection with legal, financial, and trading liabilities,* and even, incidentally, in reference to the question of loadlines as affected by deck cargoes. The greatest measure of agreement reached prior to the war (that in regard to tonnage regulations) was, however, the result of action by the various Governments. With the exception of the Suez and Panama Canal Regulations, tonnage measurement throughout all maritime countries came to follow very closely the British practice.

Government action, too, was responsible for the degree of uniformity obtained in regard to freeboard matters, and in this respect the conflict between the German and British national laws will not be forgotten. Considerable political pressure was necessary before it was found possible to obtain an agreement between the two countries on this question; but the difficulties were overcome, and the freeboard tables made approximately equivalent.

It was apparent, however, that an internationally-recognised code of regulations applicable to overseas trade was necessary; and the great Convention summoned in London after the Titanic disaster led to the idea that it would be desirable to hold an International Conference on the question of loadline. The Committee appointed for that purpose reported to the British Board of Trade in December, 1915. The war, however, put a stop to the furtherance of these discussions, and the time of the various Governments has since been so occupied with what may be termed "political" conferences, that it appeared that there would be no chance for attention to be given to the preparation of international ship regulations.

It was in these circumstances that the Chamber of Shipping of the United Kingdom and the Liverpool Steamship Owners' Association came to the conclusion that the time was ripe for the shipping community itself to take some direct part in the matter, and, at their invitation, an International Conference of Shipowners was held in London in November, 1921. This Conference, which is of historic importance, had for its motive the examination and discussion of the various phases of sea activity. Several committees were appointed, some to deal with legal matters, some to deal with trade conditions, and others to deal with the ship herself. With these latter committees the writer was somewhat intimately connected, and a short account of the work done by them may serve to show the great progress which has been made.†

LOADLINES FOR CARGO VESSELS.

The basis for the work of the Committee of the International Shipping Conference appointed to deal with this question was the report of a special committee, referred to above, appointed by the Board of Trade to formulate freeboard regulations suitable for international application, dated 1915. The freeboard regulations, as originally formulated, seem to have embodied the following premises:

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* *Cf.* Chapter in this issue of the "Annual" by Sir Leslie Scott, K.C., M.P.

† For fuller details see the paper on "International Regulations for Loadlines, Deck Cargoes, and Safety of Life," read by the writer before the Swedish Naval Architects Society, Gothenburg, August, 1923, reprinted in "Engineering," August 17, 1923, p. 217.

(*a*) The provision of a certain reserve of buoyancy which increased up to a higher limit as the size of ship increased;

(*b*) The maintenance of a sufficient "height of platform" at the bow and at the navigation position; and

(*c*) The provision of a certain structural strength.

The Board of Trade Committee reviewed the whole of the experience obtained since detailed freeboard regulations had been in operation. They found that favoured treatment had to some extent been accorded to certain types, *e.g.* the shelter deck and well-deck vessels, to the disadvantage of equally seaworthy classes, such as the "three-island" ship. These concessions, in the case of shelter-deck vessels, seemed to have arisen mainly by giving allowances for the buoyancy of spaces which by law were regarded as open to wind and weather, and thus exempt from tonnage measurement. The Committee proposed regulations which reduced the buoyancy allowance for such spaces.

In order to provide "a standard of structural strength in relation to draught," an exhaustive examination was made of the requirements of the various classification societies, viz.: Lloyd's Register of Shipping, the Bureau Veritas, the British Corporation, and the Germanischer Lloyd, who co-operated in this work. As a result, formulæ were prepared for the determination of longitudinal and transverse strength, which would indicate whether the general arrangement of the structure was sufficient for the draught.

The Board of Trade Committee considered that it was most important to ensure that all openings in the decks and sides of vessels should have proper means of closing, in order to maintain the buoyancy of the vessel, as the ordinary freeboard regulations were not concerned with internal sub-division by bulkheads.

The Committee examined the existing freeboard tables in the light of past experience, and of their proposed modified allowances for superstructures. They produced a set of tables which gave directly the freeboards for flush-deck vessels of standard proportions, and the allowance for such vessels when the uppermost deck was the top of a complete superstructure. The figures contained in these tables were arranged so that in standard vessels the actual freeboards were in agreement with previous practice; this, of course, meant some increases in special types which previously had been given more favoured treatment.

The International Shipowners' Committee, in dealing with these various points, came to certain conclusions, of which the most important were that:

(*a*) The freeboards for flush-deck vessels were generally acceptable, but might perhaps be still more increased.

(*b*) The freeboards for shelter-deck vessels *with tonnage openings* should be maintained at the same figures as formerly. The disparity between "tonnage" and "freeboard" requirements was not due to unsatisfactory freeboard assignment, and it was the "tonnage" regulations which required modification.

(*c*) While the proposed standard of strength might generally be acceptable (it was pointed out that the new Japanese regulations had adopted the standard practically in its entirety) yet some opinion was expressed that the recognised authorities might be allowed to set up their own standards.

(*d*) The reductions of freeboards permitted for summer seasons in relatively small areas, such as in the Indian Ocean, might be extended to other parts of the world which experience similar climatic conditions.

(*e*) Some attempt should be made to devise a physical determination of a steamer in such a way as to permit of a grading between the sailing ship and the steamer freeboards. It was suggested that this definition should be based upon a relation between horse-power and displacement.

This Report in its entirety was forwarded to the British Board of Trade, with the suggestion that the views expressed therein might be taken into consideration in any proposed modification of the freeboard regulations. The statutory committee which advises the Board of Trade on these matters has been asked to give consideration to the report, and their conclusions may be expected before very long. While it is not possible to forecast these conclusions, it can safely be said that the Report of the Shipowners' Committee has been of invaluable help to the British Government, and that every consideration has been given to the results of experience which the report contains.

THE CARRIAGE OF DECK CARGOES.

In this connection it may be of interest to point out from the particulars available of the distribution of Swedish wood goods, that in 1922, 37½ per cent. of the exports were taken by the United Kingdom, and another equal amount by France, Holland, and Belgium together ; of the remainder, Denmark, Norway, and Germany took 12½ per cent., and other countries the balance of 12½ per cent. These figures were very much the same in pre-war days, except that Germany took a very much larger share in those days. It might also be pointed out that Great Britain takes 50 per cent. of the Swedish wood goods which are carried in vessels trading outside the Baltic.

As an illustration of the experience which has been obtained by Norwegian vessels in the carriage of light wood goods, it may be interesting to mention that the total losses which happened in that trade from 1906 to 1919, either from the vessels being missing, having been sunk, or having been abandoned, were remarkably small. There were no losses whatever in nine of the years mentioned (1906, 1908, 1910, 1911, 1912, 1913, 1914, 1918, 1919), only one loss per annum in the years 1909 and 1916, and two losses per annum in 1907, 1915, and 1917.

To be candid, the British regulations which deal with this question have not been regarded by anyone as logical or reasonable. It would seem from a perusal of history that the question has rather been avoided than encountered. The British Loadline Committee of 1915 recognised that (*a*) there was an international need for regulations for the *security* of wood deck cargoes, but were not at that time prepared to admit that (*b*) such security could be obtained as would enable vessels carrying such cargoes to have deeper immersion. They were not, in short, satisfied with the regulations for security of such cargoes.

The International Deck Cargoes Committee held its first meeting in Christiania in February, 1922, and its second meeting in London in April, 1923. The existing Norwegian Rules were taken as the basis for discussion, and, at the second meeting, rules and regulations were finally completed for:—

(*a*) The carriage of light wood goods;
(*b*) The carriage of heavy wood goods;
(*c*) The freeboard allowances for both light and heavy wood goods.

The Committee were satisfied that the Scandinavian experience was in every way satisfactory and could reasonably be extended. That is, they were of opinion that the regulations for the security of deck cargoes of light wood were sufficient to justify deeper loading, within limits.

The argument for deeper loading had for its basis the proposal that the allowance for superstructures of wood goods should be half that permitted for a similar fully-enclosed steel superstructure; consequently it was necessary to require that for heavy wood goods the deck cargo must consist of squared timber, or lumber, of such dimensions as can reasonably be stowed into a solid deck load.

The Committee, however, considered that any reduction of freeboard should not exceed nine inches.

The general conclusions of the Committee as to the security of the deck cargo were that:—

(*a*) The deck cargo should be supported by stanchions housed in deck sockets spaced not more than three metres apart.
(*b*) There must be one efficient lashing for the deck cargoes up to the height of the superstructures, secured to eyebolts not more than three metres apart; and
(*c*) For greater heights of deck cargoes, there must be either separate lashings for that part above the height of superstructures in the case of "light" wood goods, or additional eyebolts and lashings in the case of "heavy" wood goods.

It was important to maintain in some way the necessary stability of the vessel during the voyage, and it was considered that the vessel should be upright, *i.e.* without a list, on leaving a loading port, and that the arrangement of water ballast and stowage of cargo should be such as to provide a sufficient margin for adjusting the stability, or rather the condition of zero list, during the voyage.

These regulations were submitted to the Board of Trade, but the difficulties of the British Government in dealing with this phase of sea regulations are by no means light, for, contrary to the usual custom, it happens that the detailed regulations, in this case, are contained in the Merchant Shipping Acts themselves, and to modify an Act of Parliament is not so simple a procedure as to modify regulations which give effect to a principle contained in an Act.

It is distinctly encouraging to note that the International Labour Bureau of the League of Nations has resolved to support the proposed legislation without qualification.

Loadlines for Passenger Vessels.

The third phase of the loadline question resolves itself into a consideration of the additional protection which it may be deemed desirable to give the vessel when the carriage of passengers begins to be an important part of the work of a particular ship.

The mere statement of "additional protection," without qualification, seems itself to be a contradiction in terms, not because travel at sea compares unfavourably with land traffic in respect of accidents, but because a greater measure of protection—passengers being regarded as "light and bulky" cargo—is economically possible in a passenger vessel as compared with a purely cargo ship. This was the view of the problem taken by the Convention for the Safety of Life at Sea, which associated the provision of safety with the nature of the service of the vessel.

The basis of consideration which was before the International Subdivision Committee was the Convention, the work of the British Bulkhead Committee, and the reports of the Joint Committee of the Liverpool Steamship Owners' Association and of the Chamber of Shipping, which had been at work since 1916, endeavouring to show the British Board of Trade that the regulations issued under the Convention did not pay sufficient regard to the economic conditions of passenger overseas traffic.

The International Committee concerned themselves primarily with three broad questions :—

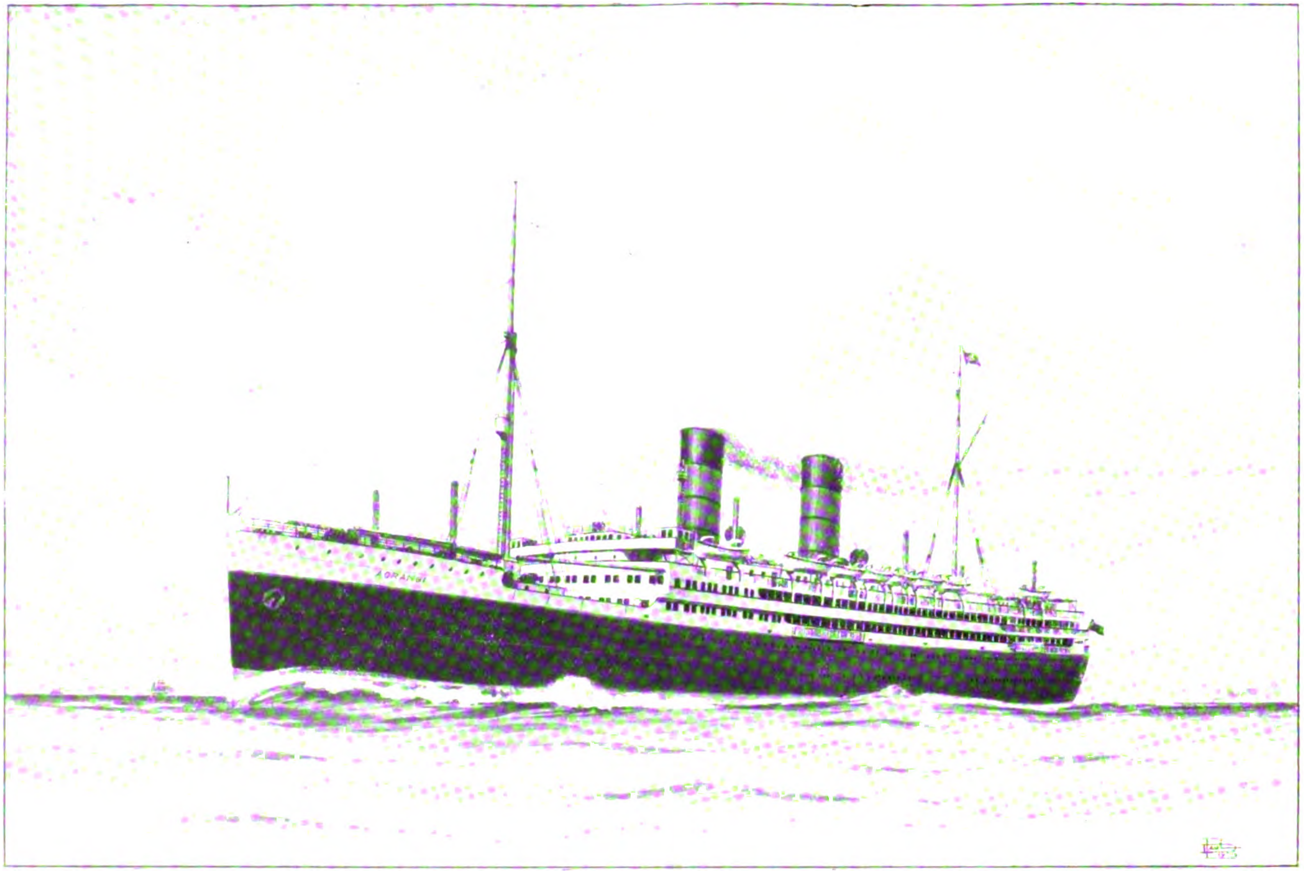
(*a*) The standard of subdivision required for vessels which carried more than twelve, but not more than a relatively small number of passengers, *i.e.* for vessels in which the cargo function was dominant.

(*b*) The standard of sub-division for vessels in which the passenger function was dominant and the cargo carried was very small or almost negligible; and

(*c*) The preparation of a definition which differentiated gradually and continuously between vessels in proportion as the passenger function grew at the expense of the cargo function. This is called the "Criterion of Service."

A large amount of research work has been carried out in Great Britain to attempt to achieve a reasonable balance between safety and economic requirements, and the International Shipowners' Committee, with full knowledge of this work, laid down certain broad conclusions:

(*a*) For vessels which may be described as "full-passenger," the curve C of the Convention should be adhered to up to 550 feet in length, after which safety requirements were



(*From a drawing by D. Paul.*)

MOTOR PASSENGER LINER AORANGI FOR THE UNION STEAMSHIP COMPANY OF NEW ZEALAND.

(*Under construction by the Fairfield Shipbuilding and Engineering Co., Ltd., Govan.*)
(*For particulars see p.* 269.)

reasonably met by the provision of a two-compartment standard with a 10 per cent. margin for contingencies.

(*b*) For vessels carrying mainly cargo with a small or "nominal" number of passengers, the curve B of the Convention was too exacting, and should be adjusted so as to provide a length of cargo hold of 80 feet in the forward part of the vessel for ships of about 440 feet in length and over.

(*c*) The "Criterion of Service," which measures the passenger function of the ship, should take account of:
  (i) the percentage of the volume below the bulkhead deck (*i.e.* the deck at which the transverse bulkheads stop) which was devoted to passenger accommodation and to the machinery space;
  (ii) the number of passengers carried; and
  (iii) a proviso that the minimum sub-division requirements should apply when the number of passengers exceeded twelve, but was not greater than a number equal to the square of the length of the vessel in feet divided by 1000.

(*d*) That the bows of vessels shall receive additional sub-division varying from a two-compartment for the first two bow compartments to a three-compartment standard for the first three compartments, as the length and passenger service increases.

The Committee made many other recommendations with the hope of obtaining simplicity and equality of treatment, and it felt that it would be possible in the future to achieve greater ease of determination with equal accuracy of comparative treatment.*

The results of the work of this Committee have also been published, and are under consideration by the British Board of Trade, who are likely to come to a decision very shortly, after interviews with the British representatives of the International Committee dealing with the subject.

FUTURE WORK.

This very short account of the work of these International Committees is not by any means complete, nor is it possible to say anything about the labours of the Committee which dealt with life-saving appliances and wireless telegraphy—both of which have been examined and to some extent adopted by the British Board of Trade.

But this account, short as it is, does record a great advance towards international understanding between the nations engaged in world maritime trade, and it may be interesting to recount some of the experience gained at various meetings.

As a general rule, it was found preferable to discuss the subject under consideration in its historical aspect, and to use as the basis for discussion the latest pronouncements and investigations which were available. Various representatives would then recount their experience in the particular phase of sea activity under consideration, and would indicate the directions in which regulations were unduly restrictive and in which new or further regulations should be made, having due regard to economic requirements. In short, an endeavour was made to formulate a proper standard for the safe conduct of maritime transportation in the light of the experience of the representatives constituting the Committee, and later to embody this standard of conduct in such regulations as could be administered by the competent authorities.

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* See a paper by Sir Archibald Denny, Bt., read before the Institution of Naval Architects at the Summer Meeting in Holland, Sept. 1923.

The next step in procedure which has been adopted by the British representatives is to place the reports and proposed regulations before the Board of Trade, with the endeavour to obtain immediate adoption of these regulations. It is understood, also, that a similar course is being followed in other countries, and already in Sweden and Denmark the Governments have to some extent adopted the recommendations of the Committee which dealt with the question of deck cargoes of light wood goods.

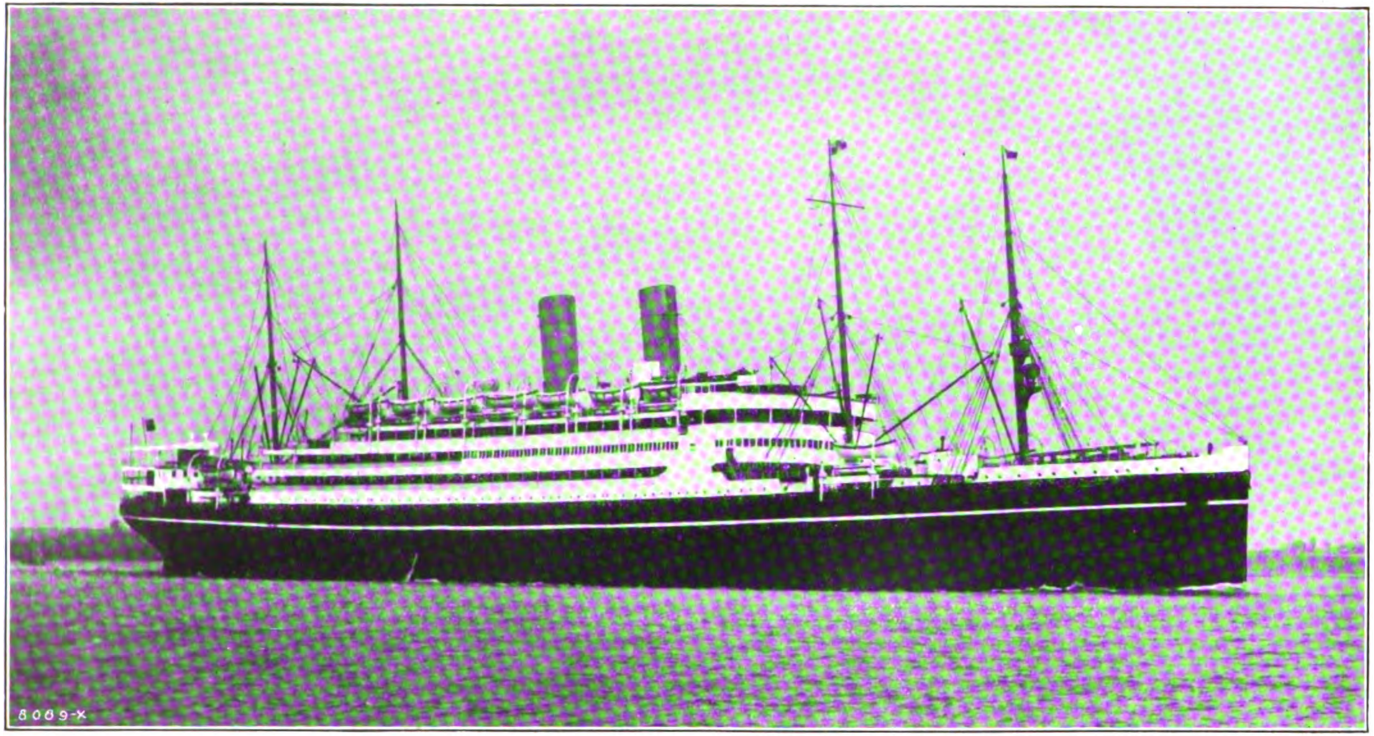
It must not, of course, be forgotten in framing these regulations that the civil laws of the various countries involved are, to some extent and in certain directions, founded on somewhat different bases, and probably the greatest difficulty in the way of the general acceptance of the reports of the various Committees will be the necessity for some co-ordination of the civil laws of the nations where those civil laws do not at present accord with the principles which have been found essential for the safe conduct of sea transport.

It will be seen, as already stated, that the work which has been carried out is of fundamental importance to the world in general. What, in effect, is being attempted is to remove all possible misunderstanding among those engaged in overseas international trade, and thus to afford equality of opportunity for all sea traders, irrespective of flag, so long as the regulations accepted by universal agreement are complied with by all engaged in that trade.

The procedure which might be followed in all such attempts at self-government within the industry is for a Convention to be accepted internationally and its provisions included in the civil law of each of the contracting nations. In that way the sea trader who violates the international agreement will be liable in the civil courts. But even should it not be possible to arrive at an International Convention, or should any countries deliberately abstain from participating in the agreement in the hope that their sea traders may reap an advantage, yet inevitably, and in the long run, those who do not conform to the agreed standard of sea conduct will find themselves shut out of international trade by the inexorable working of economic and commercial forces.

The sea industry is therefore making a wise endeavour to discipline itself, and the general acceptance by the many nations which took part in this work of the regulations to which they have agreed will be a milestone in the progress towards that universal understanding which lies at the root of world stability. And no record would be complete without an appreciation of the high spirit and lofty purpose which animated those who took part in this work—the mere drawing up of regulations is one thing; the spirit to carry them into operation is the essential thing.

WESTCOTT ABELL.



CANADIAN PACIFIC LINER EMPRESS OF SCOTLAND.

CHAPTER II.

Standing of the World's Merchant Fleets.

Though the expansion of the merchant fleets of the world, which occurred in the years immediately following the close of the Great War, has been less conspicuous in 1923, there was a further increase, in spite of the restriction of overseas trade and the consequent fall in freights. It is a remarkable fact that whereas in 1913 there were 30,591 vessels of all types afloat, in June 1923 the number had increased to 33,507; the tonnage, which stood at 46,970,113, rose during the same period to 65,166,238. During this period, as shown in Table I., there was a decline in the number and tonnage of sailing ships, and an increase in the number and tonnage of steamers, which in this connection include motor ships.

Table I.—Tonnage of the World.

Year.	Steam.		Sail.	
	No.	Tons.	No.	Tons.
1913	23,897	43,079,177	6,694	3,890,936
1914	24,444	45,403,877	6,392	3,685,675
1915	24,508	45,729,208	6,212	3,532,561
1916	24,132	45,247,724	6,035	3,435,412
1919	24,386	47,897,407	4,869	3,021,866
1920	26,513	53,904,688	5,082	3,409,377
1921	28,433	58,846,325	4,773	3,128,328
1922	29,255	61,342,952	4,680	3,027,834
1923	29,246	62,335,373	4,261	2,830,865

Shipping and International Trade.

The sailing ship is becoming less and less important in the carriage of international trade, and interest centres mainly in the distribution of the iron and steel tonnage. In Table II., on page 226, an effort has been made to indicate the steam and motor tonnage available for passenger and goods transport.

By this process of elimination of the crude statistics, a fairly accurate estimate of the tonnage available for the carriage of goods and passengers in the ocean and coastal trades is obtained. It is impossible to carry the calculation any further, since reliable figures are not available as to the number of ships used mainly or exclusively for coastal work. The absence of these figures renders it impossible, therefore, to ascertain more exactly the number of ships and the volume of tonnage which exist in the international freight market. In the United States, France, and some other countries, including the Commonwealth of Australia, the coasting trade, moreover, is restricted to vessels under the national flags.

TABLE II.—SHIPPING AVAILABLE FOR OCEAN TRADE.

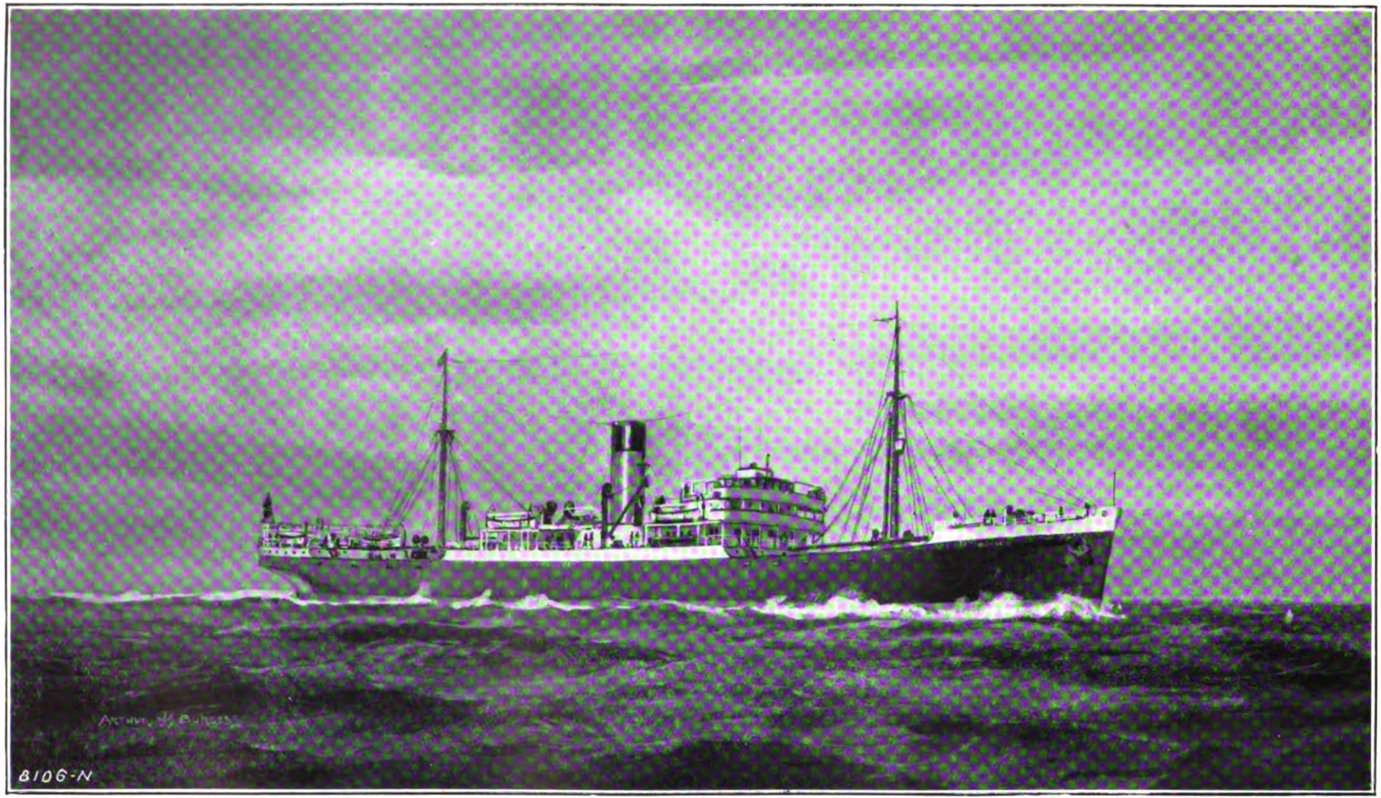
	No.	Gross tons.	No.	Gross tons.
Total tonnage of the world . .			33,507	65,166,238
Sailing ships	4,260	2,830,865		
Wooden or composite ships . .	662	348,033		
Oil tankers	917	5,160,923		
Trawlers and other fishing vessels	3,630	808,453		
Lake steamers, U.S.A. . . .	573	2,286,619		
,, ,, Canada . . .	102	240,000		
			10,084	11,675,093
Ships available for passenger and goods transport			23,423	53,491,145

RELATIVE STRENGTH IN CONVEYING POWER.

If sailing tonnage be ignored as comparatively of little importance, the standing of the principal maritime countries of the world as represented in sea-going steel and iron steamers and motor vessels is as given in Table III. in the order of precedence.

TABLE III.—SEA-GOING STEEL AND IRON STEAMERS AND MOTOR VESSELS OWNED BY THE PRINCIPAL MARITIME POWERS.

Order.	Country.	June, 1923.	Difference between 1923 and 1914.
		Tons gross.	Tons gross.
1	Great Britain and Ireland .	19,077,000	+200,000
	British Dominions	2,219,000	+812,000
2	America (United States) . .	12,416,000	+10,579,000
3	Japan	3,402,000	+1,760,000
4	France	3,265,000	+1,347,000
5	Italy	2,788,000	+1,360,000
6	Holland	2,606,000	+1,135,000
7	Germany	2,496,000	−2,602,000
8	Norway	2,299,000	+376,000
9	Spain	1,169,000	+286,000
10	Sweden	1,092,000	+100,000
11	Denmark	920,000	+152,000
12	Greece	743,000	−77,000
13	Belgium	600,000	+259,000
	Other countries	2,847,000	+790,000
	Total abroad . . .	38,862,000	+15,225,000
	World's Total . . .	57,939,000	+15,425,000



(*From a drawing by Arthur J. W. Burgess.*)

HOLT LINER DOLIUS, TO BE FITTED WITH SCOTT-STILL ENGINES.

(*Under construction by Messrs. Scotts' Shipbuilding and Engineering Co., Ltd., Greenock.*)
(*For particulars see pp.* **269** *and* **615**.)

RECOVERY OF GERMAN SHIPPING.

It will be seen that Germany, which surrendered practically all her sea-going tonnage under the Treaty of Versailles, has already crept up to the seventh position in the order of precedence in the world's merchant fleets, in spite of all the economical difficulties which have confronted her, of which her political leaders have made the most during the recurrent discussions of the reparations problem, Germany is already a serious competitor in the international trade, and is promising to be an even more serious competitor in future years. The disorganisation of her currency has proved an advantage to her shipowners, since they have been in a position to pay wages and other charges in the depreciated mark, while earning freights abroad in currencies subject to less disorganisation, and their profits have been large.

PROGRESS OF THE MOTOR SHIP.

That the steamship is being threatened by the motor ship is revealed in the latest figures prepared by Lloyd's Register of Shipping and given in Table IV.

TABLE IV.—USE OF COAL AND OIL AT SEA.

	1914. Percentage of total gross tonnage.	1923. Percentage of total gross tonnage.
Sail power only	8·06	4·34
Oil, etc., in internal-combustion engines	0·45	2·56
Oil fuel for boilers	2·65	24·23
Coal	88·84	68·87
Total . . .	100·00	100·00

Less than 69 per cent. of the tonnage of the Merchant Marine now depends entirely upon coal, while in 1914 the percentage was nearly 89.

In respect of motor tonnage, the British mercantile marine is holding its own well, although great attention is being given to the possibilities of the internal-combustion engine in Norway, Sweden, Denmark, and the United States, as the figures in Table V., on page 228, reveal.

MERCANTILE TONNAGE LAID UP.

A large amount of tonnage is laid up for want of employment due to the limited number of cargoes available. The United States Shipping Board has attempted to reflect the position in this respect on July 1, 1923, explaining that the figures given in each case in Table VI., on page 229, are not absolutely accurate, and some interpolations have had to be made.

Commenting on the statistics, the United States Shipping Board added:—

> Idle tonnage in British ports decreased from 1,667,000 gross tons on July 1, 1922, to 1,063,500 gross tons on July 1, 1923, but increased 53,000 tons over the tied-up tonnage on January 1, 1923. Greece and Australia show an increase in idle tonnage in their ports during the year. On the other hand, the idle fleet of the United States Shipping Board decreased by 155,000 gross tons, and the privately owned American vessels out of employment on July 1, 1923, were approximately 55,000 gross tons less than on July 1, 1922. Japan, Denmark, and Spain show a decline of over 50 per cent. in vessels tied up in their ports on July 1, 1923, as compared with the year ended July 1, 1922.

Probably never before in the history of merchant shipping was so large a volume of tonnage unemployed as at present, and, being unemployed, it is depreciating at a far more rapid rate than if it were being maintained in profitable service.

TABLE V.—DISTRIBUTION OF MOTOR VESSELS.

		Motor Vessels.		Auxiliary Motors.	
		No.	Tons.	No.	Tons.
British Empire.	Great Britain and Ireland . . .	139	374,873	82	18,410
	Australia and New Zealand . . .	8	5,581	24	4,176
	Canada	19	3,130	13	7,575
	Other Dominions .	17	5.378	31	12,427
America (United States)	Sea	97	139,786	45	36,425
	Northern Lakes .	5	5,200	—	—
	Philippine Islands	4	3,179	17	8,005
Belgium		—	—	8	782
Brazil		2	3,852	8	6,126
Denmark		40	132,542	72	27,492
France		34	27,958	35	14,779
Germany		45	84,528	52	24,134
Greece		5	1,202	9	3,953
Holland		52	66,577	44	9,745
Italy		34	61,374	64	31,900
Japan		20	4,375	126	24,937
Norway		130	177,071	96	36,367
Spain		8	13,378	41	10,384
Sweden		103	173,697	93	20,640
Other Countries or Country not stated		62	37,455	116	46,997
Total		824	1,321,131	971	345,254

The presumption is that the more recently constructed ships are the more efficient, but this principle does not apply to a great deal of the war-built tonnage of the United States and some other countries. But, nevertheless, the statistics which are available as to the advanced age of a good deal of the iron and steel shipping of the world are of considerable interest; they are given in Table VII. on page 229.

There are 6,913 vessels less than five years old, and their tonnage represents 35 per cent. of the total tonnage in existence. Vessels of

TABLE VI.—GROSS TONNAGE IDLE IN PRINCIPAL MARITIME COUNTRIES OF THE WORLD.

Country.	Jan. 1, 1922.	July 1, 1922.	Jan. 1, 1923.	July 1, 1923.
United States:				
Shipping Board . . .	4,814,000	3,978,000	4,411,000	3,771,000
Shipping Board tankers .	214,000	214,000	214,000	266,000
Privately owned . . .	781,000	523,000	703,000	468,000
Government-owned, other than U.S. Shipping Board	—	—	—	70,400
Total . . .	5,309,000	4,715,000	5,328,000	4,575,000
United Kingdom	1,961,000	1,667,000	1,010,000	1,063,500
France	1,085,000	1,200,000	730,000	725,000
Italy	585,000	585,000	472,000	558,901
Holland	327,000	330,000	330,000	249,905
Norway	207,000	112,000	53,000	78,000
Sweden	204,000	114,000	22,400	None.
Greece	170,000	48,000	76,000	93,800
Japan	120,000	79,000	99,000	35,800
Belgium	275,000	275,000	275,000	200,019
Denmark	161,000	33,000	17,411	7,400
Spain	530,000	530,000	520,000	241,000
Australia	50,249	100,000†	106,491	216,075
Total . . .	10,984,249	9,788,000	9,039,302	7,344,800

According to cables from Buenos Ayres and Rio de Janeiro, the following tonnage was tied up in the ports of those countries on July 1, 1923: Argentina, 15,000 gross tons; Brazil, 53,149 gross tons; Paraguay, 1,200 gross tons; and Uruguay, none.

† Interpolated from best available data.

TABLE VII.—STEAMERS AND MOTOR VESSELS ACCORDING TO CERTAIN DIVISIONS OF GROSS TONNAGE, AND CERTAIN DIVISIONS OF AGE.

DIVISIONS OF TONNAGE.	DIVISIONS OF AGE.				Total. 20 years and over.	
	20 and under 25 years.		25 years and over.			
	No.	Tons.	No.	Tons.	No.	Tons.
100 and under 500	1,192	257,537	3,202	708,467	4,394	966,004
500 ,, 1,000	287	204,152	997	730,510	1,284	934,662
1,000 ,, 2,000	392	558,968	1,050	1,520,850	1,442	2,079,818
2,000 ,, 4,000	545	1,699,454	997	2,812,488	1,542	4,511,942
4,000 ,, 6,000	372	1,771,531	239	1,145,368	609	2,916,899
6,000 ,, 8,000	111	755,148	47	316,739	158	1,071,887
8,000 ,, 10,000	37	333,112	10	84,085	47	417,197
10,000 ,, 15,000	39	463,818	9	101,328	48	565,146
15,000 ,, 20,000	2	35,737	—	—	2	35,737
20,000 and above . .	2	42,099	—	—	2	42,099
Total . . .	2,979	6,121,556	6,551	7,419,835	9,528	13,541,391

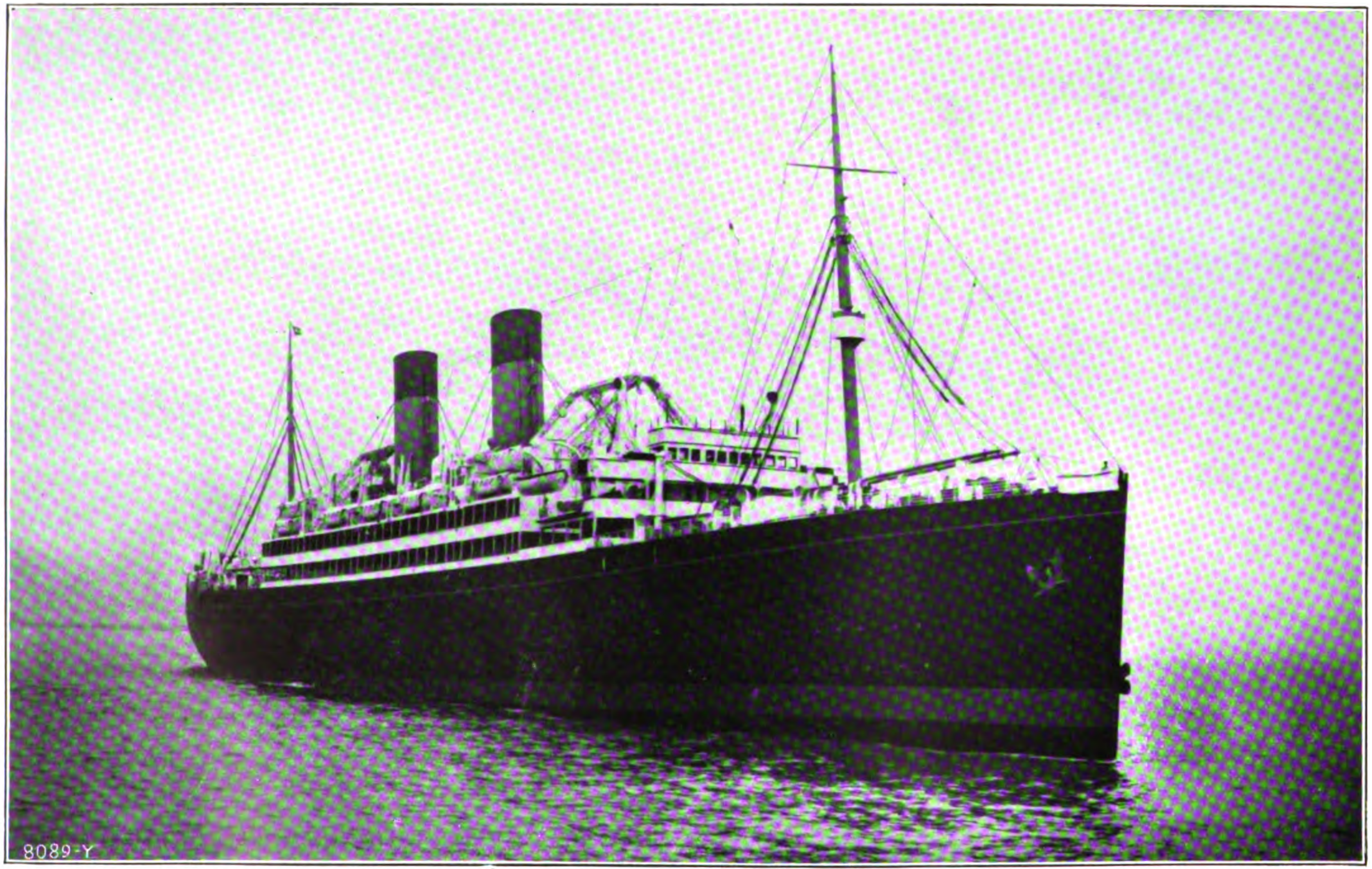
twenty-five years and over amount to 6,551, but their tonnage is less than 12 per cent. of the total. Of the vessels built prior to 1899, 64 per cent. are of less than 1,000 tons each, and the average size of the others is 2,543 tons, while of the vessels built during the last five years, only 33 per cent. are of less than 1,000 tons each, and the average of the others reaches 4,557 tons. The Merchant Navies which have the largest proportion of new tonnage (less than five years old) are as follows:—United States (Sea) 57·3 per cent., Germany 52·6 per cent., Holland 37·8 per cent., Canada 36·8 per cent., Japan 35·3 per cent., France 34·7 per cent., and Great Britain and Ireland 29·1 per cent.

In order to meet the wartime pressure for warships of all kinds, as well as for cargo vessels during the submarine campaign, British shipbuilders were urged to extend their yards on what are now recognised to have been disadvantageous terms, with the result that the berth capacity was increased by 33 per cent. In addition, warships prior to the war accounted for 25 per cent. of the value of the output of the industry. The amount expended on warships in the ten years before the war, according to figures given in the "Annual" (1921-2 edition, p. 70), amounted to £108,784,661, an average of £10,878,000 per annum. The Board of Trade import and export returns show that during the same period warships were constructed in Britain for foreign countries to the value of £14,222,694, or a yearly average of £1,420,000. The sum devoted to warship construction, therefore, represented over £12,000,000 annually, and, taking the basis officially put forward by the Admiralty in the House of Commons recently that 75 per cent. of the cost went in wages alone, these figures indicate that an average annual amount of over £9,000,000 was spent on wages. Bringing these figures to the basis of the present values would, at a very low estimate, increase them by 50 per cent., giving an average annual total of nearly 18½ millions.

At the present time foreign warship construction has completely ceased and, with the exception of small work, British warship building is represented by two battleships, estimated to cost between 13 and 14 millions, an amount which, of course, will be spread over several years. This represents a shrinkage of the warship work to about one-tenth of the pre-war average. So far as Scotland is concerned, warship building is non-existent at the moment, and many of the large establishments which have been organised for that class of work are compelled to descend to building the smallest class of merchant vessels.

The construction of merchant ships, owing to the over-supply of tonnage now afloat, has steadily fallen off, and according to the latest returns of Lloyd's Register of Shipping only just over one million tons were in hand, allowing for suspended work. The result has been a steady increase of unemployment in all the shipbuilding districts; in spite of the depression in industry generally, shipbuilding maintained throughout 1923 the highest percentage of unemployed.

THE EDITORS.



(Photo: Liverpool Pictorial Press Agency.)

WHITE STAR LINER DORIC.

(Constructed by Messrs. Harland and Wolff, Ltd., Belfast.)

CHAPTER III.

SHIPPING AND INTERNATIONAL LAW.

THE subject of International Law and Shipping is so technical as to be almost incapable of popular exposition. The phrase "international law" is used very indefinitely and loosely in popular parlance, and even to lawyers has more than one meaning. At least three different subjects might well be covered by the title, viz. (1) the rights and duties of nations, *i.e.* of Sovereign States, in regard to the merchant shipping of other nations in peace and war; (2) the regulation of the merchant shipping of the world on international lines with a view to safety of life at sea, sanitary precautions, crew conditions, etc.; and (3) the unification of the various national systems of maritime and commercial law so as to ensure that the carrying trade of the world shall be conducted under rules of law which are internationally uniform. It is with the third, and not the first and second of these heads, that this article is concerned; but a few words on the first two heads may be worth while in order to make clear the real scope of the third head.

THE LAW OF NATIONS.

"International Law" proper is the Law of Nations. It is not, of course, law in the true sense, as there are no courts to adjudicate, and no sanctions normally operating to compel performance, save in so far as that great new institution, the Permanent Court of International Justice at the Hague, created by the Treaty of Versailles, and presided over by Mr. Loder, so singularly qualified for his high position, may constitute an exception. International Law is a body of usages or rules of practice which all nations apply, or are supposed to apply, in their dealings with each other and with each other's nationals in peace and war. The interaction between international law and maritime commerce is necessarily perpetual, and in war is peculiarly direct and intricate. A ship is a citizen of one country, but a traveller in all, and even in peace, may easily run into stormy legal waters, where a conflict between the law of the flag and the local law of the country whose hospitality the ship is enjoying, can only be resolved by applying to the problem the established rules of International Law in its strict sense.

For instance, it is a canon of International Law that the flag carries the municipal law and, to some extent, the national jurisdiction with it, as regards the domestic *régime* within the ship, not only on the high seas, but in the territorial waters of another country. It is another canon of International Law that a ship enjoys the privileges of another nation's hospitality only on condition that she does not transgress the local laws which are there in force. These two canons may clash, as in the case of the Prohibition amendment to the Constitution of the United States, whose officials have recently been engaged in emptying the wine-cellars of the ships of all other nations in New York Harbour. Take another instance. British sailing vessels were fishing outside the three-mile limit on the Russian coast, and were seized by the Soviet Government, who claim that the three-mile limit should under modern conditions be altered by international revision.

These two instances exemplify the contact in peace between International Law in its proper sense and shipping. Whether International Law can in either case furnish a solution, or whether a particular agreement modifying its existing rules will be required between the nations concerned is a matter of opinion. With the rights of Sovereign Powers over, and their duties towards, merchant ships of other nations temporarily within their jurisdiction, whether in peace or war, this article is not concerned.

Uniformity of Shipping Regulations.

The regulations for the prevention of collisions at sea, or the international rule of the road, as they have been called, afford an illustration of the second entirely distinct topic. This code is international in the sense that its rules are applied by all maritime nations to their own ships and to the ships of every other nation alike, and that its genesis was in an international agreement. The obligations now recognised internationally, to a greater or less extent, as to load-line, as to carrying wireless apparatus and operators, or as to a certain quota of boats and life-saving appliances, are comparable instances. Many think it would be a great advantage if all nations enforced the same standard scale of victualling and accommodation for crews and emigrants, so as to bring all ships under a uniform international obligation in such matters. But this topic, too, of uniform international regulation of shipping, though of immense importance, is not the subject of this article.

"Inventions of the Devil."

Every maritime nation has a body of law—partly written, partly unwritten—which affects all ships carrying its flag and many ships carrying other flags but coming within its jurisdiction, prescribes the duties of the ship to third parties, defines the relations of the owner to his crew, and regulates the right and liabilities of those who want to use the ship whether as passengers or shippers of goods. Each country has its own body of laws ; the maritime law of each is but a branch of or inextricably intertwined with its common law: the particular rules of each, whilst having many features in common, vary much in detail and sometimes very widely both in basic principles and in result. Even if every nation had started in the remote past with an identical common law, separate national histories would, by the natural process of evolution, have produced inevitable divergence. But maritime nations did not all start with an identical common law: they owe their legal systems to sources as widely different as the Roman Civil Law and the customs of Germanic tribes. As things are to-day, or rather as they were at the end of the nineteenth century, the differences of law which affect ships seem often to be based on no discernible principle of natural justice: the ordinary man is tempted to think them mere inventions of the Devil for the bewilderment of shipowners and other commercial men whose business is on the waterways of the world.

The ordinary man might, for instance, well imagine that if two ships were in collision and both were in fault for negligent navigation, natural justice would have evolved a uniform treatment of a problem that must present the same characteristics, whether it arises on the high seas or in the territorial waters of England, or France, or Holland, and whether the ship carries the flag of one nation or another: and whether the case is tried in the courts of one nation or another. Nothing of the sort. In such case, down to the year 1910, in some countries neither ship would be allowed to recover anything. In others, such as England, the total damages of both would be lumped together and then divided equally between the two. In others again, the liability would be apportioned in accordance with the degree of fault, so that if ship A was only to blame for a comparatively small omission, whereas ship B had been guilty of gross negligence, the total damages would be divided so that B paid a much larger part than A. Such a diversity of legal rights and liabilities can have no justification in any abstract principle of justice, still less in any consideration of expediency. Why should the owner of the ship guilty of the venial fault have his rights of recovery depend on the mere accident of the country in which he is able to take legal proceedings against the other ship?

And it is not only in regard to wrongs done to others—torts, as lawyers call them—like collisions, but in matters of contract that there is variety and complexity of legal rules due to the difference between one national system of law and another. The difficulty of writing about it is that subjects like Charter Parties, Bills of Lading, and Marine Insurance are technical and hard to explain except at considerable length. And yet without some explanation it is impossible to make the drawbacks of legal complexity really understood. Let us take an illustration from a field which lies between the land of tort and the land of contract.

THE LAW OF GENERAL AVERAGE.

There is a branch of law, connected with the carriage of goods by sea, called "General Average," of the nature of which those words do not, to the uninitiated, convey the remotest inkling. But a typical illustration will help to explain. When a ship with cargo on board is in peril, and, in order to lighten her burden for the safety of the whole adventure, cargo is thrown overboard, the owners of the cargo jettisoned have a right to a money contribution from the owners of the cargo saved, and from the shipowner in respect both of his ship and of his freight at risk, all of whom have benefited by the sacrifice by means of which the whole adventure was brought to safety. This right has been a rule of sea law since the days of ancient Greece, when the islanders of Rhodes evolved their "Rhodian Law"; but with the development of modern commerce the cases of general average sacrifices or expenditures of money in the interests of the whole adventure which may and do arise in practice have become infinitely various and complicated. So elabŏrate a business is the adjustment of these rights and duties between those concerned, involving not only all kinds of valuations and mathematical calculations, but abstruse and obscure questions of law; so large are the sums of money involved as between the different interests affected—ship, cargo and freight—and as between the various insurers who have underwritten the risks on those different interests; and so important in practice is accuracy of adjustment that a separate and very skilled profession has actually grown up of men who specialise in this work and act almost as arbitrators between the parties concerned. They are called Average Adjusters, and there are a certain number of them in each of the big maritime countries; they are very busy, and they make incomes which are the envy of every lawyer. And the law of general average, whose mysteries these adjusters understand much better than most lawyers, boasts large text-books all to itself; and the municipal law of each one of all the different maritime countries presumably boasts its own text-book. Anyhow there are innumerable differences between one country and another.

THE CARRIAGE OF GOODS BY SEA.

For my third illustration of the bewildering complexity of maritime law let me choose a subject from the land of contract proper. The carriage of goods by sea was in England originally a matter in which the parties to the contract—the shipper and the shipowner—were free to make any contracts they chose as to their mutual rights and liabilities. If they made no special contract, our common law, it is true, imposed on the shipowner the duty to carry safely, and, so to speak, to insure the shipper against all risks of the voyage except the act of God and the King's enemies. But the shipowner was, if he chose, free to bargain with the shipper as to the particular terms on which he would carry the particular freight; and in this sense carriage of goods by sea is within the field of free contract. But if we may for the moment regard ocean commerce as a whole, two sources of complexity have arisen. Shipowners, being free to stipulate for their own terms in their contracts of affreightment, have converted the simple document of the eighteenth century into a vast network of elaborate clauses, protecting them from many, if not all, conceivable sources of liability. They have been better organised than cargo owners, and have been able by combination to induce cargo owners to accept, in the main, the shipowner's own form of bills of lading, the cargo owner as a rule insuring against the risks, or most of them, from which the shipowner has exempted himself. But in many trades merchants, too, have become organised, and forms of contracts have been the subject of negotiation between representative associations on the two sides.

FREEDOM OF CONTRACT.

In the result and by degrees, during the last thirty or forty years, common form charter parties and bills of lading have been evolved by free negotiation for different trades—Baltic, White Sea, Black Sea, etc., for timber, grain, and so on. Freedom of contract has in England been allowed by Parliament to continue in most respects, and, in the opinion of many, to the general advantage of the merchant as well as of the shipowner. The system has enabled the shipowner to carry at the minimum rate of freight; damage to and loss of goods have been covered by the insurance company; and it may be doubted whether any very serious hardships have resulted from this freedom. But the great power of the shippers of the United States, particularly of the big packing houses, led in 1893 to the passing of the American Harter Act, whereby freedom of contract between ship and cargo was curtailed. The Act made it illegal for the shipowner to protect himself from liability by the wide negligence and unseaworthiness clauses which the freedom of contract permitted by English law had made common; at the same time it protected him from liability for the negligence of his crew in navigation, provided he chose his crew properly at the start. And the Harter Act purports to apply to all ships of all nations sailing from or even discharging at United States ports. The example of the United States was in 1904 followed by Australia, in 1910 by Canada, and 1911 by New Zealand, with somewhat similar legislation. The Continental countries, whose system of law was based upon the Code Napoleon, have, in the main, like England, permitted freedom of contract for carriage of goods by sea. But the attempt by the United States and certain of the British Dominions to impose their municipal legislation on the ships of all countries using their ports, and, indeed, in respect of some things happening on the high seas, has not only interfered with freedom of contract but also produced a conflict of laws—*i.e.* divergence between the different municipal systems. This aggravation of the complexity of contracts of affreightment, already made complex enough through the elaboration of clauses and exceptions, introduced under the ægis of free contract, has produced a position of practical inconvenience.

INFLUENCE OF THE HARTER ACTS.

The diversity of documents, due to the peculiarities and history of each trade, has been increased by statutory interference at one or both ends of the international voyage. And the trouble does not stop there. The legal interpretation of any contract in its application to particular facts is dependent upon the general law of a country, whether written or unwritten. The same contract interpreted in the Courts of one country will bear one meaning, and be applied in one way, but may bear another meaning and have a different result in the Courts of another country.

The intrusion into this already complicated field of a series of Harter Acts, interfering with, but not entirely superseding, freedom of contract, has made confusion worse confounded. The Courts of the United States may attach one meaning to their legislation in its bearing on a particular bill of lading. The Courts of England, interpreting a clause in the same bill of lading, which by agreement between the parties incorporates "all the terms of the Harter Act," may arrive at a different result to the United States Courts. Indeed how complicated, and how difficult, are many of the questions of law that arise no one but the commercial lawyer fully appreciates.

THE FUNCTION OF THE BANKS.

But it is not only the shipper and the consignee and the charterer who are concerned in the obligations of the shipowner. Overseas commerce is carried on through the banks. Practically every bill of lading shipment that is made is financed by the shipper pledging the bill of lading as the document of title to the goods, to a bank in the export country. He draws upon his buyer across the seas, and the bill of lading comes forward with the invoice, bill of exchange, and policy of insurance attached. In the event of the buyer not taking up the documents, the bank may wish to enforce its security. The obligations of the shipowner are a part of its security. The bank is therefore directly interested in the measure of obligation which the bill of lading imposes on the shipowner. If it were not for the fact that it is only in the exceptional cases that trouble arises it would be difficult to understand how the commerce of the world can be carried on as easily as it is by a system of contracts of affreightment in which there is such extraordinary diversity, complexity, and obscurity as in modern bills of lading.

THE LAWYER'S PERSPECTIVE.

Lawyers are, of course, much more familiar with the exceptional than with the ordinary case. It is only in the exceptional case that the unfortunate merchant finds himself in the hands of the lawyer, and the perspective of a lawyer is apt to be distorted for this reason. For one case where trouble arises there are tens of thousands where the transaction goes through without a hitch, however complicated or unintelligible the document may be. None the less many business men have for long felt that if the bill of lading were identical in its main provisions and effects in every trade, in every system of law, and in every court, it would be of great advantage to commerce. It is difficult to disagree with them. Uniformity is more important than perfection.

Three instances have been given where unification of maritime law on international lines is plainly to the advantage of the commerce of the world—the case of a tort like collisions; the case of the common law duty of the sea modified by contract, like general average; and the case of what in modern English law is almost pure freedom of contract, like bills of lading. It is perhaps not an exaggeration to say that the maritime law of the world—the sum total of all the rules of law by which the relations of all persons concerned in maritime commerce are regulated—is a perplexing legal labyrinth; its complexity is created in the main by the multifarious elaboration of modern business, is multiplied by the variety of legal treatment meted out in different countries to identical problems,—a variety due in part to differences in their common law, in part to statutory enactments. Each body of municipal law is, as it were, a separate tree whose branches and leaves have in the course of history made their separate and individual growth. It is not surprising that the resultant differences are great; nor that many have felt an imperative need for a unification on international lines; nor that, great as is the need, the difficulty of attainment should be even greater.

THE NEED FOR UNIFICATION.

Before attempting a summary of the progress up to date in the attempts at unification, let one more word be said on the business need for unification. Take the case of the owner of the ship in collision guilty of a comparatively small fault, which has been taken as an illustration in the earlier part of this article. Assume that his ship was worth £500,000 and was sunk, but that the total damage to the other ship and cargo was also very large. Assume, again, that the case happened before this branch of law was unified internationally, and that our shipowner was uninsured. For although insurance is nearly universal in maritime business, except with some big liner companies, it is best to consider these questions *in the first instance* on an uninsured assumption. Imagine an offer of settlement from the other ship. Before he can make up his mind as to a reasonable basis of compromise he has not only to ascertain the facts of the case in order to form an opinion as to the respective blame attaching to the two ships, but he has to consider in what national jurisdiction the litigation is likely to take place if he does not settle out of Court. In one, he gets nothing; in another, the total damages are divided equally; in a third, he receives proportionately to the slightness of his captain's fault, perhaps nine-tenths. What does such a necessity for inquiry represent to a business man? This is a simple case where the differences of law can be easily stated, though not by any means so easily ascertained, by the shipowner's English lawyer if he does not already know them. But even in so simple a case he has to spend much time in considering what the chances are of arresting the other ship in the jurisdiction which is most favourable. And this is the second stage of his legal inquiry. The first is to find out what the foreign systems of law are, which in most cases is one of difficulty, even with the help of his English lawyer as at least one English lawyer knows from experience. The third is, if he does not settle, to keep a continual watch on the other ship, until she gets into port in a country where he would like to have the litigation disposed of, in order there to arrest her. And do not forget that all this time he is paying lawyers.

"FAUTES NAUTIQUES."

But even this is not the end of his troubles. All systems of national law admit some form of limitation of liability of the shipowner, for the *fautes nautiques* of his master and crew. The British system is £8 a ton of the registered tonnage of the ship in fault, or £15 a ton if there is loss of life. The United States and Continential limit is the value of the ship after the accident. If it is sunk, there is no liability. If it is damaged, it is the value of the damaged ship, freight and accessories. Limitation, then, is another element for our bewildered shipowner to consider when exploring the possibilities of arresting the other ship in a suitable port.

FURTHER PROBLEMS FOR THE SHIPOWNER.

But there is a fifth field of interesting inquiry. In some systems of law, like our own, a maritime lien attaches upon the wrong-doing ship in favour of the injured ship, which gives a kind of perpetual unwritten mortgage on the ship and holds good as against everybody who has no prior lien, including a purchaser for value without notice. The lien follows the ship into whatsoever hands she may come. Some systems of law do not recognise any maritime lien for collision. Others recognise it, but allow it to be extinguished by a sale to an innocent third party. We have here further interesting food for reflection for our imaginary shipowner.

There is yet a sixth avenue for his weary steps to explore. In England we have Statutes of Limitation which apply to many actions and prevent legal proceedings being taken to enforce a remedy after a certain lapse of time; but the period is substantial, for instance, six years in actions of contract—indeed, our Admiralty law does not admit any limitation in actions for collision. But in some other countries there is quite a short limitation of time within which action must be brought, a month in some codes. For a shipowner with a really inquiring legal turn of mind there are many other topics which would interest him in the one illustration which has been selected. But possibly the above list will be sufficient to indicate that even in a very simple case like a collision there are quite a considerable number of legal permutations and combinations to occupy the leisure moments of a busy business man.

THE SHIPOWNER AND THE TOILS OF THE LAW.

But in the life-history of a merchant-ship events of fantastic complication sometimes arise, and it is just this kind of elaborate concatenation of circumstances which gives rise to litigation. Take a case where performance of a contract of carriage is interrupted by a collision with another vessel. General average sacrifices are made;

salvage services received; the ship is taken to a port of refuge; necessaries men arrest her; a mortgagee claims; the cargo is sold by the captain, and various other things happen which all mean that liabilities are incurred to or obligations enforced by somebody. The complexity of a legal position necessarily obscure is exaggerated beyond all conception by the differences between the laws of different nations which exist to-day. There is, in truth, an overwhelming case in favour of unification.

Why should our imaginary shipowner be spending his time in trying to find out exactly what is his legal position in some foreign country? Why should he be incurring the expense of consulting foreign lawyers on a matter which in English law would admit of no doubt and require no legal investigation? Browning's aphorism—

'Tis a dangerous thing to play with souls;
And trouble enough to save one's own.

may be adapted. It is a very dangerous thing for a business man to play with foreign litigation. It is trouble enough for him to know his own laws. And the first thing for a lawyer, particularly if he happens also to be a legislator, to remember is that business men should, if it is at all possible, be saved from the necessity of wasting time and money on ascertaining their legal position—whether to guard against future contingencies or to clear up a mess when it has happened. Business men make money out of business; it is only the lawyers who make it out of law.

ARGUMENTS AGAINST UNIFICATION.

There are only two arguments against unification to which serious attention need be given. Firstly, it is said, the object of law is justice, and if you aim at unification the attainment of that end inevitably involves compromise between one system and another; in order to win the assent of all nations to a proposed international agreement it is essential that each should be prepared to give up certain of its own rules of law. Some of those rules of law, it is said, will probably be juster than those that are to be inscribed in the international agreement, particularly so in the case of British concessions, for British law is, in our modest judgment, the most just in the world. The other objection is that each system of law is a harmonious whole, a natural growth, a tree whose roots strike deep into the sub-soil of the common law, a system based on principle, and, broadly speaking, coherent and consistent; that to make a cross between our pedigree strain and the varieties grown by other nations is a retrogressive step bound to produce an indifferent breed; that a set of rules gathered, with scissors and paste from many systems, cannot manifest the inherent justice of a system evolved from one set of legal principles.

UNIFORMITY AND ABSTRACT JUSTICE.

There is force in both objections, and the reformer who aims at unification should always have both dangers in mind, in order, as far as possible, to minimise the disadvantages of selective unification. But in business uniformity is more important than abstract justice; and known rules of law, even if not perfectly consistent with principle, are more beneficial to the business world than any ideal perfection of juridical theory. Imperfections of justice tend to average out by the almost universal practice of insurance which obtains in maritime commerce. Occasional difficulties arising in practice through every one of a set of legal rules not being born of or based upon an identical common law can never outweigh the enormous practical gain of the rules themselves being well known to everybody engaged in shipping affairs. Lawyers cannot too often remind themselves of the fact that in business, it is only an infinitesimally small percentage of cases which give rise to dispute and find their way into the Courts, and that the more the provisions of the law are known, the smaller is that percentage.

The endeavour in this survey has been to lay stress on the liberation of business men from preoccupation with legal doubts, as the primary reason for unification; because it appears to me a conclusive justification of the movement for unification.

The Economic Aspect.

But the same reason may be stated in economic terms. Imperfect justice in the world of business finds expression in the price which the business man charges for running the risk of not getting justice. The risk is paid for in the freight of the shipowner for his services, in the premium of the underwriter for his cover, in the price of the producer for what he sells. And in international trade when each nation has its own law and all are different; when no one knows quite what legal risks he is running, and for safety assumes the worst possible, and charges accordingly, the result is in the end that the customer pays for it all in an increased price.

Progress of the Movement for Unification.

What has already been done in the direction of uniformity? The movement has taken two main forms—voluntary agreement and identic legislation in all maritime countries. In those branches of law, where contract between the parties is capable of substituting uniform rules for the existing diversity of national systems of law, various attempts have been made to obtain some measure of uniformity by the adoption of common form contracts based upon agreed rules. But where the subject matter is outside the sphere of contract altogether, there is no remedy except by identic legislation in the various maritime countries of the world; and as such identity of municipal legislation is obviously unattainable except by prior international agreement, the campaign for unification has had such agreement as its objective. Even in the sphere of contract voluntary unification cannot get very far; international convention, followed by national legislation, is there also the only complete and permanent remedy.

THE YORK-ANTWERP RULES.

Historically, the field of contract was the first scene of the reformers' efforts. In 1890 the York-Antwerp Rules of General Average were agreed to, as the result of a series of international but unofficial congresses—at York in 1864, at Antwerp in 1877, and at Liverpool in 1890. Various modifications of the rules of English law were effected by them, involving some assimilation of foreign law, and *vice versâ.* The set of rules thus agreed were inserted in contracts of affreightment, by agreement between the parties, so as to constitute a conventional code of law, which would regulate any general average questions arising; and the practice came to be adopted not only in English bills of lading, but in those issued in other countries. The effect was that in all contracts in the ocean trade of the world which incorporated the York-Antwerp Rules, there was one legal system on the particular subject of general average so far as the rules went. The result was a practical step in the direction of unification in the law of affreightment. Indeed, the unification was not limited to that branch of the law, but extended also to marine insurance on all topics where the obligations of the underwriter in regard to general average sacrifices and contributions follow the adjustment of the primary rights and liabilities of the parties interested in the contract of affreightment.

Some attention has in recent years been given to the possibility of applying the above method to the whole law of General Average, but these attempts have not yet passed beyond an initial stage.

THE ATTITUDE OF BUSINESS MEN.

Apart from attempts at purely legal unification, the need of uniformity has shown itself also in the anxiety of business men themselves to get standard forms of contract generally accepted. Just as each large steamship line at an early stage insisted on the acceptance of its own printed form of bill of lading, so during the last 30 or 40 years forms of bills of lading and charter parties have been negotiated between representative bodies of shipowners and representative bodies of traders in particular trades, as, for instance, grain charters from the Black Sea and timber charters from the Baltic.

The main motive of these endeavours to attain uniformity has no doubt been in each case the settlement of a set of provisions which will work satisfactorily from a purely business point of view, *e.g.* as to rate or method of discharge of cargo. But an indirect result has been to introduce agreed terms on many matters which, if left unexpressed in the contract, would be decided differently by the Courts of different countries according to the national system of law by which the contract was held to be regulated. And the growing frequency of unification on these lines has a direct bearing on the subject of this article because it affords evidence of the imperative need for unification that business men recognise in practice, whether they realise it in theory or not.

THE DISADVANTAGES OF A VOLUNTARY SYSTEM.

But the contractual method of attaining to international uniformity must obviously remain liable to the drawbacks inherent in any voluntary system. Those who for some reason do not like it, may be strong enough to stand out, either from the start or at some later stage. It may be the shipowners as a class, or the merchants. It may be one trade or another trade. It may be one nation or another nation. But the weakness is always there—men may change their minds. It follows that the obligatory method is by far the more effective, namely, identic legislation in different countries following upon international agreement.

In 1896 two distinguished Belgians, the late M. Charles Le Jeune, by profession an insurance broker, and M. Louis Franck, then a barrister with a large admiralty and commercial practice in Antwerp, now Belgian Minister for the Colonies, realising the need of unification, recognised also the impossibility of its attainment unless an international organisation could be established. The first step to agreement was to ascertain the extent and character of existing differences, the second was to discuss them, the third to select the rules of law most suitable in the interests of commerce for common acceptance, the fourth to get an international convention embodying the agreement whereby each nation should undertake to introduce legislation carrying it out. In their plan, discussion was to be based upon reports from the different countries as to the state of the law on material points; it was to take place at conferences of representatives of all maritime countries; its object was international agreement on a common set of provisions which could be recommended to the legislatures of the different countries for universal adoption.

THE INTERNATIONAL MARITIME COMMITTEE.

In that year they founded the *International Maritime Committee*, with its central office at Antwerp and a membership limited to a few chosen men, representing the shipowners, merchants, underwriters, lawyers, and so on, of the leading maritime countries. Affiliated to the central body with its permanent bureau or secretariat was a national association in each country, whose duty it was to report on the chosen subject, to answer a questionnaire as to what alterations they recommended, and to send representatives to an International Conference convened by the I.M.C. Following this procedure, by the year 1904 draft conventions on the law of collisions at sea and salvage had been drawn up, subjects obviously outside the realm of contract and beyond the reach of any remedy by agreement inter parties. These draft conventions were submitted to the Belgian Government, who thereupon summoned a Diplomatic Conference to consider them. This conference, to which Lord Sterndale, the late Master of the Rolls, the present writer, and the Hon. Hugh Godley were the British delegates, was followed by other conferences in 1909 and 1910, similarly convened by Belgium, where the drafts were further revised; and finally, at the last conference the two conventions were signed by the plenipotentiaries of twenty-five different states. They were subsequently ratified by the High Contracting Parties, though the United States have not yet ratified that on collisions at sea.

Pursuant to the plan of the conventions, most signatory States have passed legislation to give legal effect to the provisions of the conventions: the Maritime Conventions Act, 1911, being the British contribution.

FURTHER PROGRESS OF THE MOVEMENT.

Concurrently with the later stages of the work upon the two above-named conventions, the I.M.C. undertook the consideration of two further subjects—the Limitation of Shipowners' Liability, and Mortgages and Maritime Liens, subjects of much greater difficulty than collisions or salvage because, on the one hand, of much greater divergence of national systems of law and of the inherent complexity and intricacy of the subject matters, and, on the other hand, of the fact that different business interests concerned were more likely to take different views as to their private advantage, in regard to particular provisions of the law concerned. The subjects were discussed at conferences of the I.M.C. at Antwerp (1898), London (1899), Paris (1900), Hamburg (1902), Amsterdam (1904), Liverpool (1905), and Venice (1907), and draft conventions prepared by the I.M.C. were submitted through the intervention of the Belgian Government to the Diplomatic Conference at Brussels in 1909. They were there fully discussed and again considered at official conferences in 1910 and 1911, and remitted to a special committee in 1913. In the intervals the various interests concerned in this country were consulted by our Government, and although certain interests—such as the dock owners—were critical or required certain protecting provisos, general international agreement on these intricate and difficult subjects seemed almost in sight when war broke out.

After the war the I.M.C. was re-established and held a conference at Antwerp in 1921. It found its previous efforts in regard to collision and salvage rewarded by legislative acceptance in many countries and the state of opinion apparently ripe for agreement on the branches of law covered by the Limitation and Mortgage Conventions, as redrafted by the Diplomatic Sous-Commission of 1913. In addition, it had before it proposals which had started at the Conference of Liverpool in 1905 for an international code of affreightment, *i.e.* for a uniform code of the whole of the special rules of law governing contracts for carriage of goods by sea and the chartering of ships. These proposals had been put into preliminary shape by a Committee of the I.M.C. which sat in London in 1913 under the presidency of the late Lord Justice Kennedy. But by 1921 the urgency of this large project had been superseded by more limited proposals calling for more immediate realisation. The report of the British Imperial Shipping Committee of February, 1921, presided over by Sir Halford Mackinder, M.P., with representatives of each of the Dominions on it, had advised concurrent legislation by all the

Parliaments of the Empire with a view to the adoption of provisions based upon the precedent of the Canadian Sea Carriage of Goods Act, 1911, an Act on the same lines as the Harter Act of the U.S.A., passed in 1893.

The policy of those Acts and of the similar Australian and New Zealand Acts was by law to prevent shipowners from inserting in their contracts of carriage clauses which give them what is thought by some critics an undue measure of immunity; in other words, to protect the owner of the goods by preventing the shipowner from getting out of his liabilities too much.

It was this policy of a statutory limitation upon shipowners' freedom of contract imposed in the interest of exporters, which was the main objective of the recommendation made by the Imperial Shipping Committee. Neither unification of maritime law nor standardisation of commercial documents appeared in their report as a guiding motive, although the Committee clearly recognised the value of uniformity. But in June 1921, the cause of unification was helped forward by the International Chamber of Commerce, which passed resolutions in favour of (1) the adoption of a uniform transoceanic international bill of lading; (2) uniform legislation by all countries; (3) pending such legislation an attempt to obtain the voluntary insertion of an agreed set of rules in all bills of lading.

These resolutions, if carried out, were calculated to promote the desired end of international uniformity. But they also tended to improve the status of the bill of lading as a document of title and as a negotiable instrument—the indorsee would no longer be at the mercy of the casual bargain made between shipper and shipowner, but have the benefit of defined and certain terms binding upon the shipowner in any event; and bankers as well as importers would enjoy the benefit. And it is interesting to note in these resolutions the recognition of the procedure of international agreement followed by legislation in each country as the indispensable condition of successful unification.

THE HAGUE RULES.

During the war (when the I.M.C. with its Belgian headquarters was necessarily out of action), the International Law Association (whose activities are not limited to maritime matters and who before the war had, as a courtesy to the I.M.C., left most questions of Maritime Law to that body), had taken up this question of bills of lading and formulated a set of rules on the subject, for international adoption by voluntary agreement. The proposed rules were, with the concurrence of the I.M.C. given at its conference at Antwerp in July, 1921, brought before the conference of the I.L.A. at the Hague in the following September, under the presidency of Sir Henry Duke, President of the Admiralty Division. By his tact and wisdom agreement was attained, and the "Hague Rules," as they have since been known, were passed at the Conference, nearly all the interests concerned and most maritime countries being represented. These rules were, during the next six months, approved by the

International Shipping Conference in London, and further revised by negotiation between shipowners and merchants in this country. At first it was hoped that the plan of voluntary adoption by parties to Bills of Lading contracts upon which the I.L.A. had prepared the Rules would suffice. But it soon became apparent that unification could only be attained by the I.M.C. method of international agreement and legislative compulsion. Partly for this reason, partly in order to get complete agreement between the various interests concerned all over the world, the Rules were referred to the London Conference of the I.M.C. in October 1922, when they were put into final shape for diplomatic consideration. The Brussels Diplomatic Conference followed in a few days, nearly all the leading maritime countries, including the U.S.A., being represented, and it was agreed unanimously to recommend a convention based on the rules as approved in London with a few minor alterations.

Pressure for British Legislation.

In the meantime, however, the International road had become a little obstructed. At the Imperial Conference of 1921—before there had been any official talk of international agreement—the British Government had given a pledge to the Governments of the Dominions that the scheme of the Imperial Shipping Committee (for uniform legislation within the British Empire on Harter Act lines) would be acted upon in this country if the Dominions were prepared to follow suit. A Government Bill was, therefore, actually in preparation in 1922, at the time when the final discussions upon the Hague Rules were taking place between the interests concerned in this country. The importers here were then pressing hard for immediate British legislation—independently of international agreement, and the Government accordingly promised to introduce a Bill during the then current Session of Parliament. Fortunately the negotiations in this country on the Hague Rules, between those who had agreed to them at the Hague and various other interests, who were demanding modifications, resulted in agreement in the spring of 1922, and it was possible for the Government, with the concurrence of the Imperial Shipping Committee, to treat the Hague Rules so revised as suitable for adoption as the basis of the Government Bill.

But, perhaps also fortunately, the Bill was not presented before Parliament rose in August, and the Diplomatic Conference was free to consider the Hague Rules without the issue being prejudged by any British Bill having been introduced independently. After Brussels, the draft rules there agreed on provisionally, were accepted both by the British Government and by the Imperial Shipping Committee, as a fair implement of the promise made to the Dominions; and accordingly the Sea Carriage of Goods Bill, embodying them in the Schedule, was introduced and passed its Committee Stage in the House of Lords during the present session, after exhaustive examination by a Select Committee of both Houses, presided over by Lord Sterndale, which heard witnesses from every interest affected, including Lord Justice Scrutton and Mr. Mackinnon, K.C., who were critical and opposed. In the result they reported that there was "no serious opposition to the Bill from the commercial interests affected and that the great majority of them were strongly in favour of it": and that the legal "objections did not outweigh the advantages to be gained by giving statutory force to an agreement concluded by those chiefly affected by the legislation."

A FURTHER CONFERENCE.

The position now (September 1923) is that a Special Commission, appointed by the Diplomatic Conference last October, is to reassemble in Brussels on October 4 next, in order if possible to attain final agreement on the precise terms of a convention which may be forthwith signed internationally. This convention can then be substituted for the existing schedule to the Sea Carriage of Goods Bill, by amendment in the House of Commons.

It is obvious that the plan adopted, in deference to the demands of our business interests, of introducing the Bill in the British Parliament, without waiting for complete international agreement, involved some risk of causing international disagreement, although our Government took pains to make clear to the Belgian Government how we had become committed to our Dominions, and that we were only pressing forward in order to give a lead and thereby expedite international agreement.

Indeed, some criticism arose, as was natural, during this year in regard to certain details of the Rules, emanating from particular trade interests, or particular countries. The subject is one which touches everyday commercial practice so closely that the changes involved in any unification of divergent law and practice are bound to evoke some opposition. But it is greatly to be hoped that general agreement, without further change on any material points, will now be attained through the Brussels meeting, and that the convention will be there signed by sufficient States to enable our Government to move its insertion in the Sea Carriage of Goods Bill when Parliament meets in November.

The bill of lading is in modern trade the main security upon which the seaborne commerce of the world is financed, and the international adoption of one and the same instrument for all bill of lading shipments will be a great boon not only to the bankers but to shipowners and merchants alike. And it is plain that such a measure of commercial standardisation and legal uniformity was unobtainable except by the organisation and procedure created by the I.M.C. of international agreement followed by national legislation.

STATE-OWNED SHIPS.

At the London Conference of October 1922 another subject of immediate practical importance was taken up. There is a rule of law adopted by this and most other countries that a foreign Sovereign is not amenable against his will to the jurisdiction of the Courts, at any rate of the Courts of another country. As a corollary to this rule our Courts have conceded immunity from liability to State-owned ships, for instance, in respect of damage done by a collision for which the foreign State-owned ship may have been solely to blame.

Many such decisions have been given, particularly in recent years; for since the war many Governments have owned and run merchant ships. Instances are afforded by Portugal, Esthonia, and Australia; and it may be that the American Shipping Board is in law the Sovereign State of the U.S.A., or its agent. Privately-owned shipping concerns naturally feel keenly this competition of State-owned ships which can sail the seas free of all liability; and, not unnaturally, regard it as unfair competition. It is obviously unjust to the privately-owned ships and also to the owners of the cargo carried on both the privately-owned ship and the state-owned ship —*e.g.* in case of collision. It was unanimously agreed by the London Conference of the I.M.C. that this state of affairs must be ended, and the principle involved was referred to the Diplomatic Conference at Brussels in October 1922 for consideration.

Although the Conference did not enter upon any formal investigation of the subject a great preponderance of opinion there manifested itself in favour of the abolition of the rule of immunity; but by reason of the political crisis in this country, which ended the Coalition and installed Mr. Bonar Law's administration, it had not been possible to instruct the British delegates or authorise them to commit their Government on the subject.

The I.M.C. held its Thirteenth Conference at Gothenburg in August 1923, and there again it was unanimously agreed that this rule of immunity of State-owned ships must be abolished. The Conference accordingly directed the Permanent Bureau of the I.M.C. to prepare a draft convention for submission by the Belgian Government to a new Diplomatic Conference. Care is, of course, necessary that interests of a public character, such as national defence, shall be properly safeguarded; but no doubt this can be done, whilst at the same time bringing to an end the scandal of unfair State competition with private trade. The grievance is really one of immediate urgency, and it is to be hoped that it can be referred to the Diplomatic Conference at Brussels at an early date.

At Gothenburg a new subject was opened up, that of the compulsory insurance, up to a limited sum, by shipowners of all passengers, or at least of all emigrant or third-class steerage passengers. The subject had been mooted before the war, both at Conferences of the I.M.C. and at Diplomatic Conferences, by Signor Berlingieri of Genoa.

At Gothenburg discussion was opened in an interesting and forcible paper advocating the proposal by Sir Norman Hill, who speaks with such unparalleled authority for British shipowners. Agreement was not reached, but it is obviously a suitable subject for international consideration, and the discussion produced a useful interchange of views which may lead to agreement hereafter.

DIVERGENCE OF ENGLISH AND FOREIGN LAW.

The two subjects of Limitation of Liability and Mortgages and Liens which, as already stated, were before the Diplomatic Conference, October 1922, are very technical and raise a large number of collateral issues as well as many important questions of detail; and it is impossible to do more than outline the position.

Perhaps the biggest divergence between English and foreign law in connection with them arises on the different methods of limiting liability. That shipowners should have their liability limited is a part of the law of the sea all the world over. The preamble of one of our early limitation statutes, passed in 1734 (7 Geo. II. c. 15) says :—

> "Whereas it is of the greatest consequence and importance to this Kingdom to promote the increase of the number of ships and vessels, and to prevent any discouragement to merchants and others from being interested and concerned therein";

and the Act accordingly limited liability for thefts of gold, etc.

> "to the value of the ship or vessel with all her appurtenances and the full amount of the Freight due or to grow due for or during the voyage."

This view, that the dangers of the sea are so great that men will not adventure upon it, unless their risks are limited, is the historical basis of the rule. It rests, of course, on a similar economic policy to the limitation of liability conferred on those who take shares in Joint Stock Companies—viz. the encouragement of commerce. The British and Continental conceptions differ to-day, but in origin were the same, viz. that each time that a shipowner adventures his property on a voyage, the fortune that he risks in that ship shall be available for the satisfaction of claims arising out of that voyage, but *per contra* that he shall not incur a general personal liability to be satisfied by execution upon his whole patrimony. This is what the French Law means by its *fortune de mer;* the ship, the freight, and "accessories"—or rights of redress in connection with ship and freight which may accrue to the shipowner during his voyage. The shipowner, when claims are made, may abandon his *fortune de mer* to his creditors—their rights are against the *res*—or "real," and are not against the shipowner himself—or "personal." These characteristics follow: firstly, every claim arising out of the voyage is subject to the *droit d'abandon,* whether due to the torts of the master and crew or to the contracts of the master made in virtue of his authority as master, and whether the claim is in respect of property or person; secondly the whole voyage is the unit of limitation; and thirdly it is what is left of the *fortune de mer* at the end of the voyage which the owner may abandon, so that if the ship is totally lost and there is no freight, the liability becomes nothing at all.

THE SHIPOWNER UNDER ENGLISH LAW.

English law has, partly through judicial interpretation, partly by statute, followed two divergent roads. In the U.S.A. it has followed the Continental road and is to-day broadly identical with, *e.g.* French or German Law. In England, on the contrary, whilst the principle of limiting liability to ship and freight still underlies our law, six main differences have developed: (1) The rights of creditors are "personal" and not "real": the shipowner and not merely his *fortune de mer* is liable—hence he cannot "abandon." (2) Whilst our earlier statutes said the limit of that liability should be the value of ship and freight, it was judicially decided on them that the value must be estimated *before* and not *after* the casualty, *e.g.* a collision giving rise to the claim; so that the total loss of the ship does not free its owner. (3) As a corollary of (2), the value is to be estimated on "each occasion" which gives rise to a liability, and the whole voyage ceases to be the unit of limitation. (4) As the liability is personal, contracts by the captain are indistinguishable in principle from the contracts of any other agent or servant, and are not within the limitation—except in so far as special immunities have been conferred by statute, as for valuables under contracts of carriage, or losses by fire. (5) In 1862 Parliament, for simplicity, and to put the high-valued ship on an equalty with the low-valued ship, substituted for the value of ship and freight a fixed figure of £8 a ton on the tonnage of the ship, for property claimants. (6) This figure was at the same time increased to £15 a ton where there is loss of life, thus giving a separate fund of £7 a ton for such claimants.

INTERNATIONAL COMPLICATIONS.

The result of this diversity of law—and the chief heads of divergence have been sketched—has of course been to make the subject one of great complication internationally. But in addition it has to a material extent handicapped British shipowners in their competition with foreigners. The "law of the flag" has not been applied regularly in foreign Courts—for instance, in the case of the Utopia, which was sunk in collision with a British battleship in Gibraltar Harbour with great loss of life to Italian emigrants on board her, the Italian Courts refused to allow her to limit her liability under Italian law as the ship was British; they refused to allow her to limit under British law as that was not binding on the Italian Courts. But apart from the risk of having one system of limitation *added* to the other, the British shipowner suffers in competition by the limit of liability of foreign ships being on a lower average scale than his own; and from the impossibility in practice of enforcing in British Courts our own higher scale of limitation against a foreigner, who, after incurring a big liability, may leave his ship badly damaged and of little value under British arrest but keep his *other* ships out of the reach of the British Admiralty Marshal besides and so escape legal process. Lastly, the foreigner has, by his common law, the right of limitation even in regard to claims of bills of lading or by necessaries men on orders of the captain—which our shipowner has not.

A POLICY OF COMPROMISE.

The above epitome of the main divergences between the British and Continental systems of limitation is sufficient to show how difficult a task unification has been. And yet a common recognition of its value to commerce has achieved it—or nearly so. The result of previous labours and of the work at Brussels in October 1922 is as follows: the two systems have been combined, certain characteristics of each being adopted. The Continental *droit d'abandon*, the right of throwing over to the creditor the wreck or other remnants of the *fortune de mer*, is abolished; so is the general rule which makes the whole voyage the unit of limitation. Instead, the shipowner is made personally liable up to the value of his ship, freight, and accessories *after* the accident with a maximum for property claims of £8 a ton on the tonnage of his ship, to this extent the two systems being combined. But the English rule of a separate limitation for each "occasion"—*e.g.* each collision, is substituted for the rule of the whole voyage. And instead of the freight itself, with the risk of there being no freight, and anyhow with the difficulties of ascertaining it, a money figure of 10 per cent. of the ascertained value of the ship *before* the accident is substituted, to be payable in any event even if the ship is lost and even if there is no freight at all. In addition life claims will be treated much more liberally than under the existing Continental-American system, which limits them on the same footing as property claims. A separate personal liability of £8 a ton (instead of £7 as to-day in England) will be imposed over and above the value of the ship freight and accessories, so that life and personal injuries claimants will not find themselves entirely without remedy as they may do to-day, but will always have a substantial personal liability fund of £8 a ton on the tonnage of the vessel. This is in itself a great reform.

There are still, of course, some critics—the dock authorities of this country have been, for instance, asked and given special treatment. But broadly speaking the convention is one which ought now to be signed after its final polishing up at Brussels.

MORTGAGES AND LIENS.

The subject of Mortgages and Liens is in Continental jurisprudence inextricably intertwined with that of limitation of liability. In the Common Law of the Continent, wherever a creditor may be exposed to a limitation of his debtor's liability by the debtor's right to abandon his *fortune de mer*, there the creditor gets a lien on the ship, freight, etc., which entitles him to priority according to a certain order of ranking. The Continental nations were therefore absolutely unwilling to agree on a Limitation Convention unless we at the same time agreed to a Liens Convention, and *vice versâ.*

In addition, the Mortgage and Liens Convention had an importance of its own. From the point of view of maritime credit it is desirable both to improve the position of the mortgage, and to have some international uniformity about liens. In English law a registered mortgage on a ship affords a security prior to all creditors, except those having a maritime lien; but in some Continental countries an English mortgage is invalid and in the United States till quite recently a mortgagee had no preferential rights at all. The objects of the Mortgage and Liens Convention may therefore be regarded as being to improve and regularise the position of the mortgage creditors, to define the rights and ranking of those having a maritime lien; and at the same time to limit the number of liens which take precedence of the registered mortgage and to define the conditions of such priority.

The present plan, as it is emerged from the discussion of October 1922, is shortly as follows: Mortgages properly registered according to the law of the flag are to be valid everywhere; certain maritime liens, and those liens only, are to take precedence of the mortgage, and it is proposed that they shall be:

(1) Court fees, tonnage, and light dues, etc., costs of preserving the vessel, etc.
(2) Wages.
(3) Salvage.
(4) Collision.
(5) Necessaries ordered in foreign ports and master's disbursements.
(6) Claims arising on bills of lading.

It is proposed that the last two liens shall rank in front of mortgages only if anterior in date to the mortgage and registered within three months of their date.

The six liens are to rank in the above order. Those States which have not any of them are to create them—*e.g.* the lien for collision is not universal to-day. Other liens may exist in municipal law, but they cannot affect mortgages or take precedence of any of the above liens.

A mortgagee may lose his priority if he does not give notice at the registry that he requires his mortgage to be notified on the ship's papers. This stipulation is essentially fair to claimants who may acquire liens under heads (5) or (6).

There is little doubt that the convention will simplify and improve the financial credit of a ship as security and thereby help commerce. And it is difficult to exaggerate the international confusion that pervades the subject under the various national laws which exist to-day. It is *par excellence* a subject in which unification and simplification will be of value.

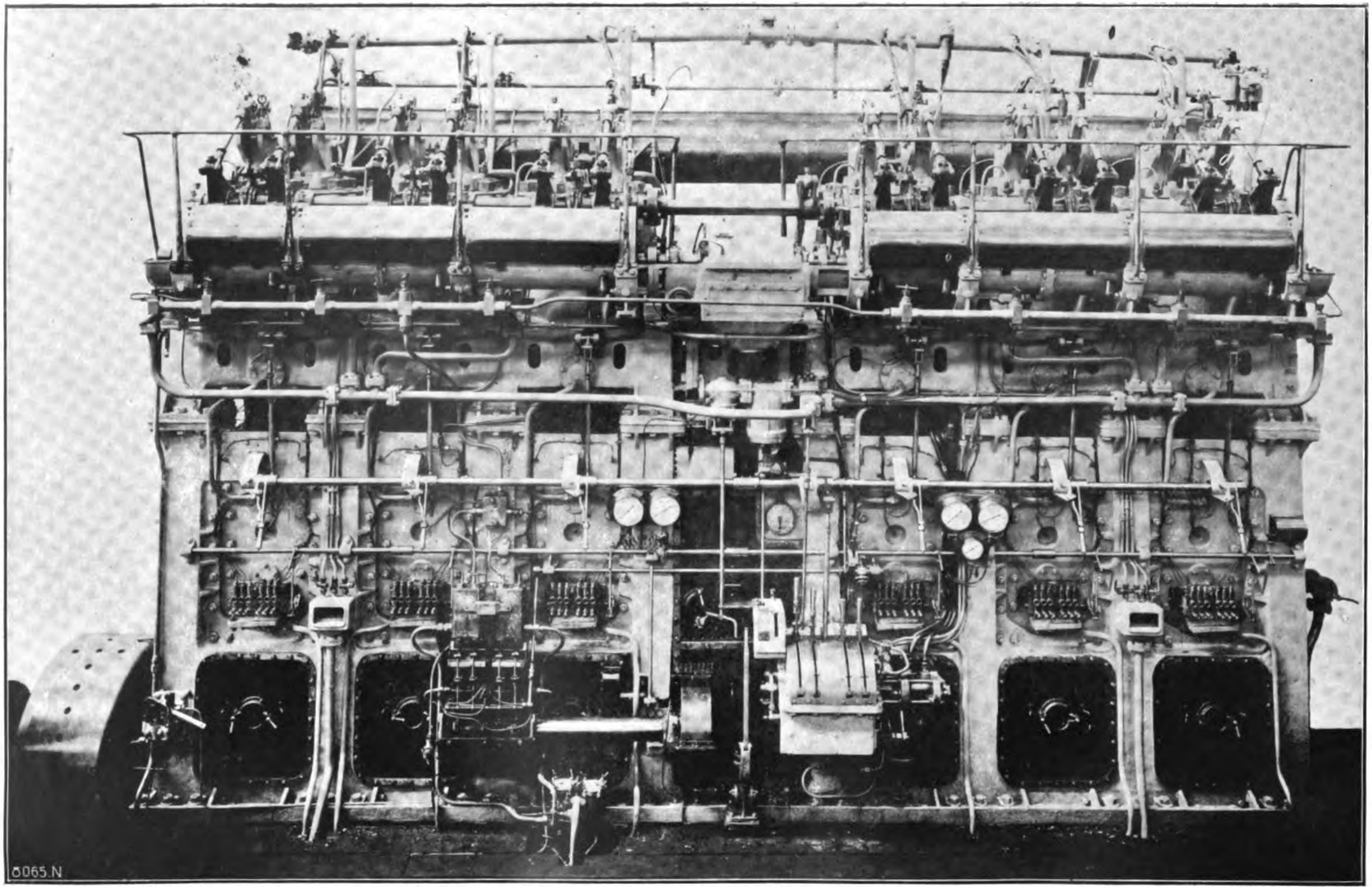
IN THE INTEREST OF WORLD COMMERCE.

This statement on the progress may appear long, complicated, and dull to the ordinary reader; but it is of small account if he is bored, so long as in the process he realises the astounding complexity of that tangle of laws which regulate and perplex the overseas commerce of the world; for it will mean a convert to the policy of international unification.

The subject is obviously one in which different interests will, on each branch of law, take different views. And commercial men are not all ready to recognise the practical importance to them and to their pockets of mere unification and uniformity. The particular needs arising out of their particular habits of doing business loom sometimes a little overlarge on their horizon. The opinion which is forced upon one as a result of thirty years' experience of commercial work at the Bar, and of nearly as long an experience of the movement for unification of maritime law, is that it is much more important in practice to business men that the law should be the same everywhere than that it should be ideally just or that overmuch attention should be given to the existing methods of business in particular trades. The problem must be approached as a purely practical problem. There is very little room for legal theorising. But judged by this criterion it may be urged that the balance of advantage is in favour of the adoption internationally of a convention on any branch of maritime law as soon as a stage of agreement has been reached where the great majority both of nations and of interests affected approve of the solution proposed. It is very easy to deprive the great majority of a common advantage to all by undue consideration for the hostile criticism of a sometimes over-vocal few.

This statement of faith and record of progress would be incomplete if it did not give expression to the profound sorrow which all those concerned in the long-sustained campaign for unification feel to-day in the recent death of Lord Sterndale, the Master of the Rolls. His broad common sense and shrewd practical wisdom, coupled with a tact which never failed, and a knowledge of the subject which his modesty never allowed him to admit, were priceless aids to discussion in the Conference Chamber and to negotiations outside it. Every member of the *Comité Maritime International* looked upon him with respect and admiration, and grieves that he is gone.

LESLIE SCOTT.



VICKERS' SOLID-INJECTION MARINE OIL ENGINE FOR JAPAN.

Six cylinders 18½ ins. dia. by 27 ins. stroke, developing 600 B.H.P. at 150 to 160 revs. per minute.

CHAPTER IV.

MARINE ENGINEERING TO-DAY.

ALL considerations of shipbuilding and marine engineering to-day are subservient to the depression—unparalleled during the last generation—into which these industries have fallen. So severe are the conditions at the present time that unquestionably, in very considerable measure, technical developments—even normal progress—are subject to the inevitable retarding influences of bad trade.

The lessons of naval engineering are not always directly applicable to mercantile work, as was pointed out in the issue of the "Annual" for 1923 (page 231), yet only when the effects of the cancellation and suspension of such construction, as are obligatory by the provisions of the Washington Treaty, are fully experienced, is the great debt which engineering, in all its phases and branches, owes to the compelling influence of naval work clearly demonstrated. The surprise, therefore, is not so much that marine technical development is retarded due to the depression in trade and the relatively negligible quantity of Admiralty work now going forward, but that the progress to be here recorded is definitely so substantial.

Shipping is now suffering the maximum disabilities arising from the excess tonnage constructed during the war, shortage of cargoes resulting from world-wide trade dislocation, and the consequent low freights. Nevertheless, the average age of much of the shipping on the high seas to-day is too great for the best economy of transport and minimum maintenance costs, and many ships must be replaced at an early date.

The degree of insistency of the call for replacement can to a considerable extent be controlled by the engineer. This fact requires much wider recognition. The perfection of technical improvements tending to the increased economy of operation of shipping, either resulting from lower first cost, reduced running expenses and maintenance, can only result in the more rapid obsolescence of tonnage not in conformity with the latest ideas. It is therefore imperative that every line of development promising improvement should be diligently pursued with the utmost determination to secure proof of the fulfilment of promised results in actual sea going. Conversely, and especially at the present time, those whose natural conservatism inclines them not to depart, unless compelled to do so, from the accepted path, should not adopt an attitude or express opinions charged with extreme scepticism of novelties. These only postpone the date of the recovery of trade, by fostering a belief that the replacement of old tonnage can be further delayed.

There can be no gainsaying that experiments at sea are very costly, alike to the shipbuilder, engineer, and shipowner, yet progress must be maintained. It is being very generally appreciated that, with the average cargo carrier, the type and construction of the engineering equipment is the prime decisive factor in determining through its running and maintenance costs the actual dividing line between a margin of profit and loss. Due to the very smallness of that margin, even under the best conditions to-day, no item is too unimportant to warrant the most careful scrutiny of its possibilities, and it is for this reason that this chapter is not confined to the leading developments, but will deal in some detail with what might be described as the lesser auxiliaries.

PASSENGER SHIPS.

For the propulsion of the largest type of high-speed passenger ship, the steam turbine still presents the only solution, and, to obtain the best results, some form of gearing must be interposed between the turbine and the propeller, to give a good overall efficiency expressed in terms of distance steamed at full speed per unit of fuel consumed. In comparison with the direct drive, *i.e.* large relatively slow-speed turbines generally driving directly four small propellers, the savings with the geared drive due to the combination of the increased efficiencies of the much higher-speed turbine and slower-running propeller have not been so great as had been hoped, but are yet very considerable and are not less than 7 per cent. To an extent, difficult to assess, some of the savings in the main machinery have been negatived by the increased consumption of the auxiliaries of increasing size demanded by the multifarious and growing demands of the ever critical and observant travelling public. Nevertheless, the saving in fuel and the better passenger accommodation made possible with geared turbines have fully justified their adoption.

MECHANICAL GEARING.

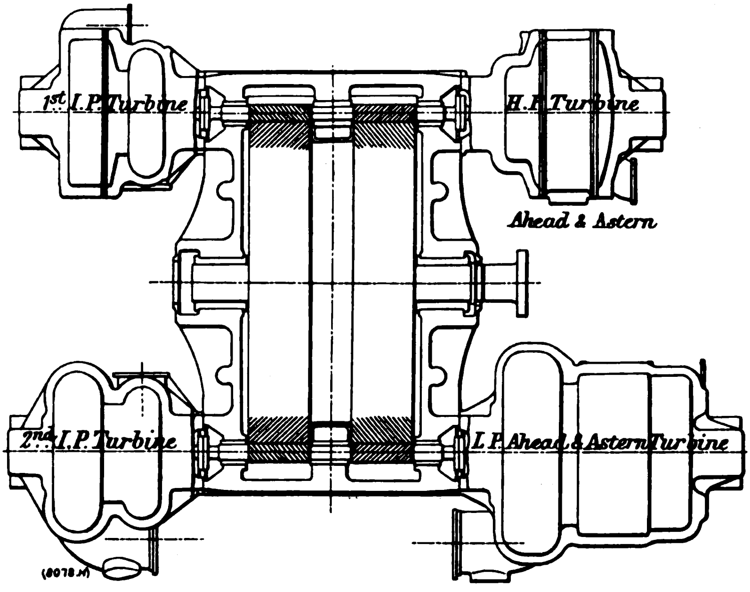
It is highly satisfactory to be able to record that the gearing troubles experienced in the years immediately succeeding the war, have been gradually overcome, and the position of gearing to-day is greatly improved in comparison with that related in last year's "Annual." There has been no fundamental change in the type of designs generally adopted. In some cases tooth loading has been decreased, but, just as previously, this has not been proved in any way conclusively to have been a decisive factor as between success and failure. Designs giving an increased degree of flexibility have shown an improvement in certain installations. There only remain the two questions of workmanship and materials. Workmanship undoubtedly has greatly improved. It is now widely admitted that if the gear is of the rigid type, the workmanship in all its phases, alignment, bearing of the teeth, etc., must be of the highest order. It may be, although not yet established, that, with a definite degree of flexibility between certain of the component parts, the degree of accuracy and refinement in the workmanship will be more commercial than is now considered essential with a rigid gear. In this connection a very apt simile* was drawn when the Rolls-Royce and the Ford cars were considered as representing, respectively, the acme of rigidity and flexibility of construction. Under certain arduous conditions of service recently, these were the two automobiles that performed successfully.

On the subject of materials it seems clear that, in respect of reliability and full measure of those qualities necessary to withstand the loads imposed by what is a severe duty, steels are now available to the marine engineer in which every confidence can be placed.

The net result is that the confidence of the shipowner has been very largely re-established, and those cases where reversion to single from double-reduction have taken place may be regarded simply as a passing phase in no way indicating the future trend.

TURBINES.

With the application of high-speed turbines, made possible by the introduction of gearing, it is not surprising that turbine blading has not been entirely free from troubles. The relative merits of the various materials employed have still to be assessed, but it must be recorded that the application of Monel metal has given good results in service. This metal is expensive in first cost, but if it serves to improve reliability it will be increasingly adopted.



TWIN-SCREW SINGLE-REDUCTION SET OF TURBINES.

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* See *Engineering*, vol. cxiv., page 180.

It is possible to ring the changes on many arrangements of the turbines and the gearing, and the most interesting novelty in this respect is the scheme adopted by Messrs. Blohm & Voss of Hamburg for the twin-screw single-reduction sets of 12,000 S.H.P. (total) of the Albert Ballin, shown on the preceding page. The virtues of this layout are compactness, and the reduction to a minimum of the torsional strain in the two pinions. It will be clear from the diagram that space has been economised and that each pinion is driven from both ends and normally end thrust is practically eliminated. For this reason, no thrusts have been incorporated in the turbines. In the event, however, of even a partial strip in any one of the four turbines the balance would be disturbed, and with no thrusts for locating the pinion shafts endwise, steam would have to be shut off entirely from the defective side. The expansion of the steam in four separate turbines makes for economy and permits of short turbines being adopted.

In arranging the installation of turbines, greater attention is being paid to the question of facilitating the lifting of the turbine top halves for inspection, and the steam pipe lines in some recent designs have been kept remarkably clear of the casings. When the starting platform must of necessity be in close proximity to the turbines and the main steam pipes, the design of the means of ventilation must be most carefully considered. Both these factors contribute largely to ensuring a well-run installation.

BOILERS.

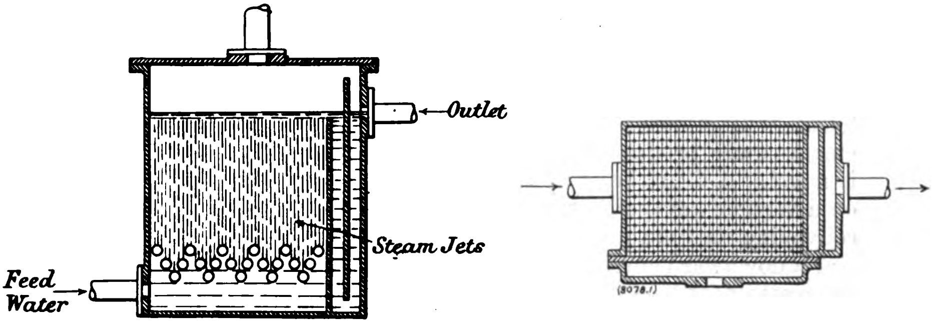
Scotch marine boilers, with or without superheaters, are almost universal for steam generation in merchant ships. The savings in fuel due to the adoption of superheaters is greater with reciprocating engines than with turbines, and the fitting of the smoke-tube type of superheater means a large increase in the number of steam joints and makes the boiler smoke tubes less accessible for inspection, cleaning, plugging, or renewal. Steam jet cleaners are always fitted, and are efficient for removing soot from the tubes. However, the reasons given have led to the abandonment of superheaters in some recently completed mailboats, which will run in competition with exactly similar oil-fired steam machinery with superheat. The results will be very interesting, and will throw light on the actual saving from superheating with turbine marine machinery.

Whilst on land the water-tube boiler is exclusively used for large and modern power installations, it makes little, if in fact any, headway in merchant ships. In efficiency, ease of steaming, and maintenance, the heavy and clumsy Scotch type is difficult to displace. On land the relative inefficiency of the water-tube type is counteracted by the installation of feed-heater economisers which abstract a fair proportion of the heat from the flue gases. It is easier ashore to ensure that the feed water shall be reasonably pure. Mechanical handling of the coal from the railway wagon to the fire bars is readily arranged for.

DE-AERATION OF FEED WATER.

Water-tube boilers probably are more sensitive to corrosion than Scotch type, and the difficulties of maintaining pure feed at sea, especially with a number of reciprocating steam-engine-driven auxiliaries, need no emphasis. There is, in addition, the inevitable leakage of air into the exhaust steam through leaky joints, glands, etc., and the latest researches have shown that this air has a vital influence in fostering corrosion. A new system for driving off the air from feed water has been developed by Mr. D. B. Morison, of Messrs. Richardsons, Westgarth & Co., Ltd. The features of this de-aerator are shown in the diagram on this page.

The continuously flowing body of aerated feed water is passed through one or more chambers of the de-aerator in which it is raised to, and maintained at, boiling point by steam issuing from a number of small perforations or nozzles in the upper halves of multiple tubes evenly distributed over the bottom of the apparatus. From these nozzles, local films of steam are projected upwardly and produce unconfused lines of flow approximating in speed to that of an air bubble rising naturally through water.



FEED-WATER DE-AERATOR.

The absolute pressure, and therefore the boiling point, can be varied to suit a large range of conditions. For example, condensate from a high vacuum condenser is usually discharged at, say, five degrees below the temperature corresponding to the vacuum, and, in such a case, the condensate can be maintained at boiling temperature when passing through the de-aerator with an expenditure of steam approximating to ¾ of 1 per cent. of the condensate, whereas if it is desired to heat and de-aerate at atmospheric pressure and temperature, a correspondingly larger quantity of steam will be absorbed, this quantity being reduced by one-half if the de-aerated discharged water is used in a surface heat exchanger to raise the temperature of the water to be de-aerated.

MECHANICAL STOKING.

With water-tube boilers, mechanical stokers are readily arranged for, and the experience at sea with such plant is distinctly encouraging.* The type of stoker chosen in the Dutch s.s. Parigi and Palimi was of the well-known "Underfeed" type, permitting of hand firing if necessary owing to any defect in the mechanical stoking plant. Coal still has to be handled from the bunkers to the hoppers, large coal also has to be broken up into suitable sizes, clinker sometimes requires removal from the hand doors, and the overall efficiency of the plant, in which superheaters were not fitted, is not high. Although, so far as is known, not yet attempted, it should be possible to devise reasonably compact mechanical means for installation in a ship for breaking up ordinary steam coal to suitable sizes for mechanical stoking.

AIR PRE-HEATERS.

On the other hand, as already stated, the results are encouraging, because of the betterment of stokehold conditions, and the ease of maintaining a steady head of steam. It is to be hoped that the experiments may be pursued. Economisers, as fitted to land plants, are inadmissible at sea, because of the lack of available space. Forced draught air heaters are substituted to serve the same purpose of reducing the flue-gas temperature. In this connection, developments are taking place, and the most interesting is the new air heater with which are associated two great names in the history of steam-power production—Howden and Ljungström. The principle is novel. A drum built up of thin corrugated metal sheets is rotated on a vertical axis so that, at each revolution, every part of this heat-conveying medium passes through an upward stream of hot flue gas and a downward current of cold forced draught, carrying thus directly the waste heat from the former and imparting it to the latter on its way to the boiler furnaces. In this neat apparatus, one motor or steam engine serves to drive the rotating heat-carrying drum, a forced-draught fan, and a flue-gas fan, which latter deals with the flue gases after the heat has been extracted from them. The drum is carried on rollers running in ball-bearings, so that any possible uneven expansions have been provided for. In the driving mechanism, a clutch capable of slipping is incorporated to allow for the remote contingency of excessive load due to seizing. A simple steam jet operated intermittently, and through which every part of the rotor must pass, frees it of soot. There are, as yet, no examples of this heater at sea. Trials ashore have given remarkable results. The flue-gas temperature is reduced from over 500° F. to little more than 200° F., and the air is heated from an atmospheric temperature of 70° F., or thereabouts, to over 400° F., giving a very high rate of exchange of heat.

Questions as to the amount of flue gas which may leak into the forced-draught air, the advisability, because of condensation and so corrosion of the uptakes, of reducing the temperature of the flue gases to so low a point, and the extra first cost of such an installation, naturally arise. There appears to be small chance of leakage of flue gas; condensation should not take place, and in time, probably, simplification and increased accessibility will be achieved.

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* "A few results from practical experience with mechanical stokers applied to marine water-tube boilers." By W. J. Muller, Esq., M.E. (Delft), Associate Member. (Paper read at the Summer Meeting of the Sixty-fourth Session of the Institution of Naval Architects held in Holland, September 5, 1923.)

However, efficiencies overall of over 85 per cent. have been recorded with the Scotch marine type of boiler fitted with air pre-heaters, and the consequent saving in fuel is considerable. The performance at sea of such a boiler-room auxiliary, which is now being installed in a number of ships, will be watched with the closest attention, and the thought suggests itself that water-tube boilers with mechanical stokers and efficient air pre-heaters present a scheme for marine propulsion worthy of study, even though no means are yet available for mechanical handling of the coal from the bunkers to the hoppers of the stoker.

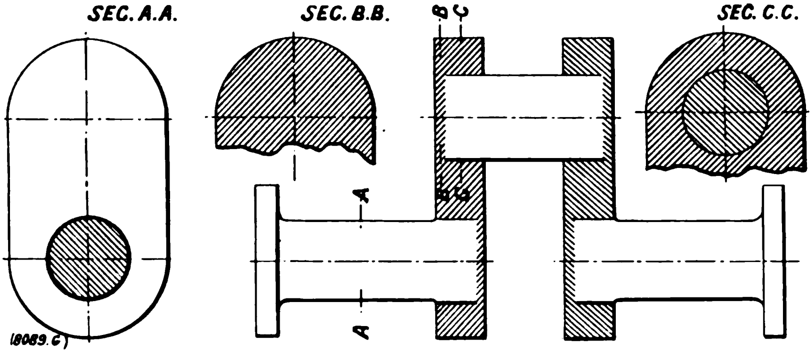
PULVERISED FUEL.

Pulverised coal for marine work has been suggested as giving, with solid fuel, all the advantages of regular steaming, ease of control, and reduced boiler-room attendance of fuel oil. The most practicable line of development will be to pulverise the coal at the boilers as required, a separate pulveriser being installed for each boiler. Such machines are quite small and are no more costly than a chain-grate stoker. The method, which is coming into use on land, avoids all possible danger of explosions due to stored coal dust, and does away with the handling of the powdered fuel. Before it can be considered for marine work, there must be much more development ashore of this method of firing.

THE RECIPROCATING STEAM ENGINE.

Mention has been made of reversion from double- to single-reduction gearing in the case of the larger type of ships. In a much greater number of instances of new construction now going forward, however, reciprocating steam engines have been preferred to either. Notable examples are the new liners for the P. & O. Company. To any student of marine engineering, or to the pioneer wishing to succeed with any new development afloat, the modern steam reciprocator forms an unequalled example of full compliance with marine conditions. Any departure from the principles which it embodies as the result of a century's concentrated experience and experiment, will involve a great risk of failure unless fully covered by compelling reasons of first principles. The modern marine steam engine, with good condensing plant, forced draught, air heaters, and superheat, is a very efficient prime mover. Superheat gives much greater savings with reciprocators than with turbines, and to assess the relation at twice the gain will hardly be an exaggeration. Fifteen per cent. reduction in the fuel bill has been obtained due to the fitting of superheaters to reciprocating steam-engine installations.

The diagrams on the next page illustrate an improved construction of crankshaft, applicable equally to steam and oil engines, which has been developed on the North-East Coast and is being adopted for a number of installations. Welding is used to reinforce shrinking, and the advantages gained* appear to eliminate the well-known disadvantages of both the solid forged and usual built-up systems of construction.



Diagrams illustrating a New Construction of Crankshafts.

AUXILIARIES IN STEAMERS.

Appreciation of the important part played by the engine-room and deck auxiliaries in respect of the annual fuel bill of a steamship is growing, and there are two distinct tendencies towards economy becoming strongly marked. The saving effected by the electric driving of all the auxiliaries is now indisputable. Reference to this subject will also be made when dealing with the motor ship, but in the case of steamships, where the deck winches consume at least 75 lbs. of steam for every effective horse-power of work accomplished, very marked economies have resulted from the conversion of these auxiliaries from steam to electric drive with current derived from steam-driven generators in the engine room. This system will undoubtedly gain in favour, in spite of the extra first cost of the electrical drive. Sufficient steam must be available for feed-heating at sea, but it can be shown that any deficit from the auxiliaries' steam exhaust can be made up with advantage by tapping off from a suitable stage of the main turbine.

Another very attractive means towards steam economy is the growing application of vertical Uniflow steam engines for the separate steam drive of various units. Hitherto, the difficulty of draining the small clearance volume in the bottom of the cylinder has restricted the Uniflow engine to the horizontal type. The Watson engine has positive draining of this space, and the reduction in steam consumption when compared with the average simple engine is very substantial.

Diesel engines have not yet been adopted for generating current for the electrical operation of oil-fired steamers' auxiliaries, but the

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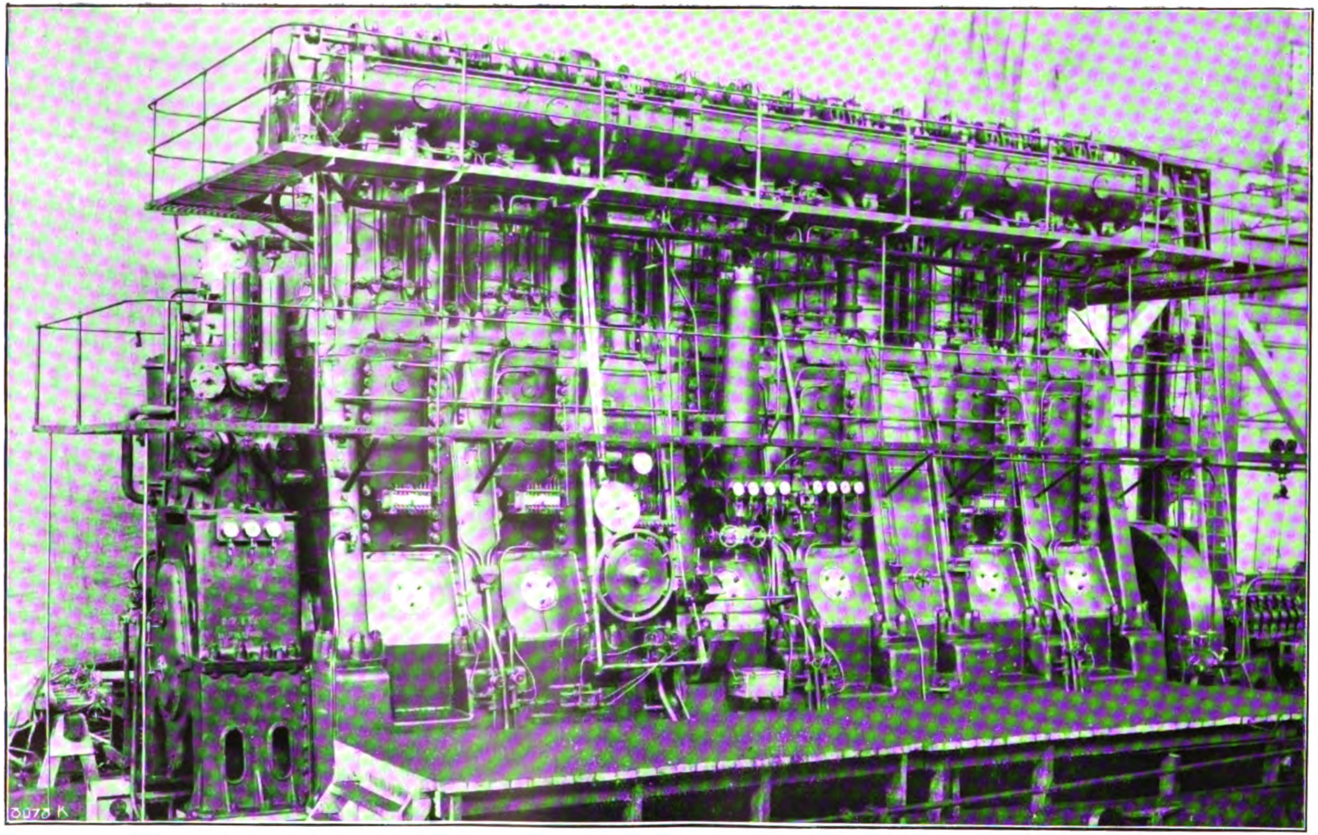
* See the National Physical Laboratory Report No. 15 of the Internal Combustion Engine Sub-Committee.



1250 B.H.P. RICHARDSONS' BEARDMORE-TOSI MARINE OIL ENGINE FOR THE M.S. SYCAMORE.

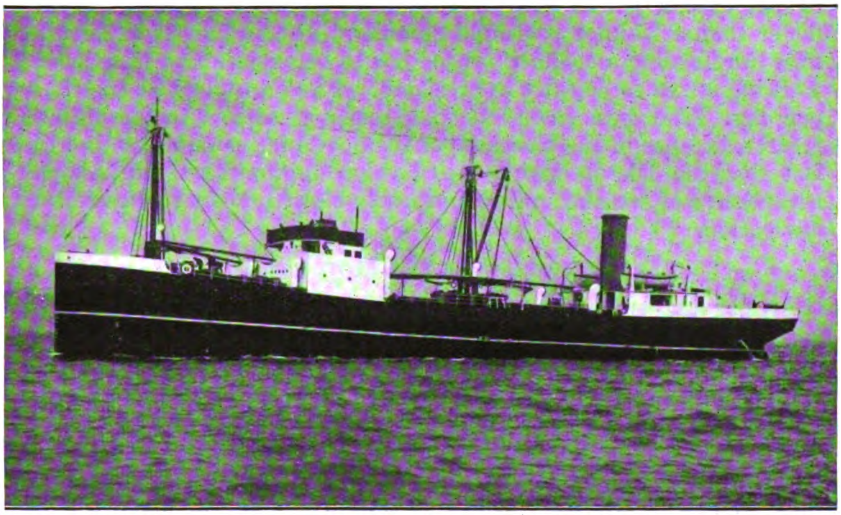
(Constructed by Messrs. Richardsons, Westgarth & Co., Ltd., Hartlepool.)

application of this method cannot be long delayed, and only awaits satisfactory means for combining the function of feed-heating with the Diesel-engine jacket-cooling and exhaust systems.

For the larger class of ship, oil-firing of boilers has become the standard practice. In spite of fluctuations in the prices of fuels, solid and liquid, there have been no cases of conversion or reconversion to solid fuel. In fact, there are coal-fired mailboats to-day which will be converted to oil-firing at the first favourable opportunity. With cargo carriers, excepting oil tankers, oil-fuel firing in a number of trades is showing a saving over coal, but the tendency is for this system to be displaced by the Diesel oil engine.

THE DIESEL OIL ENGINE.

This latter system marks the greatest innovation since the inception of mechanically-propelled vessels. In point of rapidity of application in every possible direction, whether as regards number of vessels for multifarious duties, power of machinery or variety of types of engines under construction, the present position is remarkable. In 1914, the number of ships so fitted was 297, to-day it is 1,620 with a horse-power totalling over 1½ millions. Power per cylinder, since 1911, has increased from a little over 100 B.H.P. to over 1,000 B.H.P., *i.e.* ten times. Of new constructions recently ordered all over the world, oil-engined vessels form a large proportion. Several marine-engine works, which only commenced building oil engines during the last 10 years, have turned over completely to the internal-combustion engine, and no longer construct steam plants. Those maritime nations which were first led by economic conditions



M.S. PIZARRO, BUILT AND ENGINED WITH SINGLE-SCREW BEARDMORE-TOSI DIESEL MACHINERY BY MESSRS. WILLIAM BEARDMORE & CO., LTD., DALMUIR.

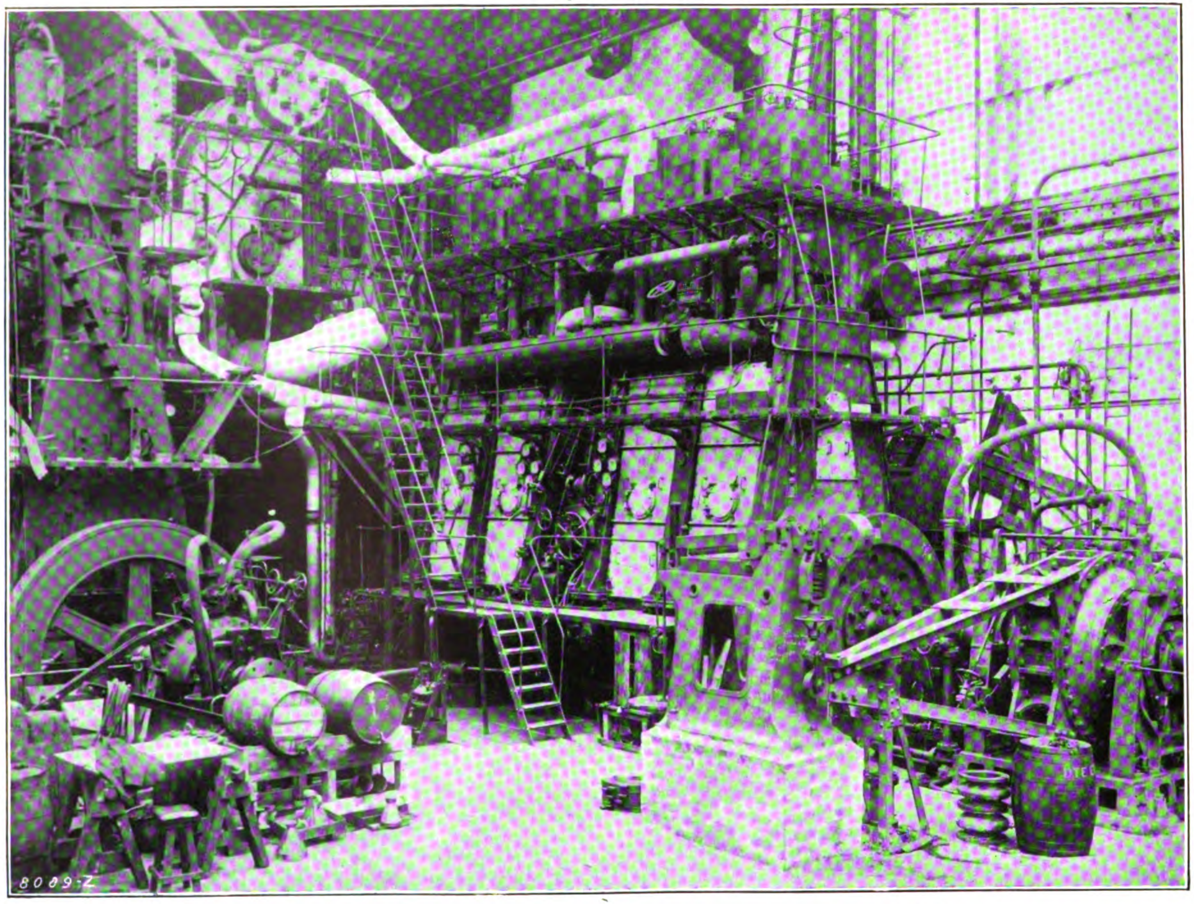
to develop this type of prime mover are its most consistent adherents, and there it bids fair almost totally to supersede steam at sea. The present depression in shipping has enhanced the claims of the motor ship, by giving greater prominence to its economies. Time has only served to confirm the savings possible. To attempt to tabulate them is extremely difficult. Each case requires individual and particular treatment. In the Merchant Shipping Reference Section, a *résumé* of comparative costs is given, but only as a guide towards the possibilities. Home prices of fuel oil and coal are assumed. Obviously, if a motor ship and a steam ship are both trading on the same route where fuel oil is cheap and coal dear, the gains with the motor ship are a multiple of those shown. It has been proved that even in the home trade, *i.e.* bunkering coal in the cheapest market and fuelling with oil in one of the dearest, the Diesel ship shows a considerable saving in running costs.

No cognisance is taken of the higher average speed of the motor ship both in fair weather and in a sea-way. It is to be recorded that in one case, a Diesel ship of 13½-knot trial speed was, in service, faster than a 15-knot coal-fired steamer. The influence of cleaning fires in retarding a steamer's speed has to be experienced from actual working at sea to be fully appreciated. Fires are cleaned six times per day. The gain in speed in a sea-way with a motor ship is greater, because of the closeness of the governing possible, and of the fact that the Diesel engine can develop approximately full power irrespective of weather unless purposely slowed down to ensure safe navigation.

ECONOMIES OF THE MOTOR SHIP.

It has recently been suggested in the Press that a complete investigation into the economies of the motor ship should be inaugurated and carried out by authorities such as some of our leading Technical Institutions, similar in scope and aim to the data now being collected for land engines by that excellent body the Diesel Engine Users Association. Anything that will foster developments or promote progress is to be urged, but it is considered almost an impossible task to equate all the various factors which go to make up the balance-sheets of ships. Unless exactly similar in all respects excepting the propelling plant, and on exactly the same trade and route, comparisons may be more misleading than illuminating. From a consideration of the statements previously made this will be clear. It is further questionable whether shipowners would consider it in their best interests to make available all the facts that would necessarily have to be considered.

An authoritative committee composed of representatives of the British Admiralty and members of the Institutions of Naval Architects and Mechanical Engineers, and embracing all the principal technical marine interests in the country, has recently been formed for carrying out exhaustive tests upon marine Diesel engines on the test bed and at sea. The first engine has been tested at West Hartlepool—the first Beardmore-Tosi engine built by Messrs. Richardsons, Westgarth. It is understood that these trials have been most successful, and the



1250 B.H.P. SCOTT-STILL ENGINES FOR HOLT LINER DOLIUS.

(Under test at the Works of Messrs. Scott's Shipbuilding and Engineering Co., Ltd., Greenock.)
(For particulars see pp 269 and 615.)

results of the sea trials of M.S. Sycamore, in which these engines are to be installed, will be awaited with great interest. One set of the engines of this ship is illustrated on the Plate facing page 261. Another installation of machinery is to be similarly tested by the same committee. This is built on the Still system* by the Scott's Shipbuilding and Engineering Co., Ltd., Greenock. The engines are illustrated as they stood on the test-bed on the Plate facing this page, and the ship in which they are to be fitted on the Plate facing page 227.

It is considered that such investigations as this Committee is very thoroughly pursuing, are the practical limit to the scope of such procedure. In due course, when the report is published, the included data should form a most valuable addition to the present knowledge of the marine Diesel engine, and should be of great assistance alike to the designer and constructor of oil engines and to the shipowner.

CONSTRUCTORS OF OIL ENGINES.

There has been very considerable advancement in construction of marine oil engines at home. A table on page 264 shows the builders of large marine oil engines in the British Isles. Whilst the greater percentage favour the two-stroke cycle, there is much more four-stroke cycle construction going forward. A table is also given in the Merchant Shipping Reference Section of notable and typical motor ships in service and building. The tendency, quite strongly marked, is for any gap, in respect of weight and size of the engine, which may exist between the four- and two-stroke-cycle engines, to be very considerably narrowed.

The last column in the table shows that gradually the fuel consumption of the prime mover, when expressed as lbs. per square inch of piston area per hour, is being increased, and now reaches more than 0·3 lb. with a number of varying designs, including four-stroke-cycle engines. This figure is, after all, the fundamental criterion of the weight of the engine and the loading to which it is subjected when developing the rated power.

FOUR-STROKE-CYCLE ENGINE.

With the four-cycle engine better materials, increased piston speed, and slightly higher mean pressures in the main cylinders are now adopted. For single-screw ships, which are finding increased favour because of disappearing doubts as to reliability, the reduced personnel required and the lower maintenance charges, long-stroke engines are preferred, giving a higher propulsive coefficient and permitting of the adoption of the completely built-up type of crankshaft. Two examples are shown on page 265. Several new features will be discernible in the Burmeister & Wain design there illustrated. The liner is now bolted to the flanged bottom wall of the cylinder head, permitting of a better distribution of the water spaces around the valves. In accordance with standard four-stroke-cycle practice,

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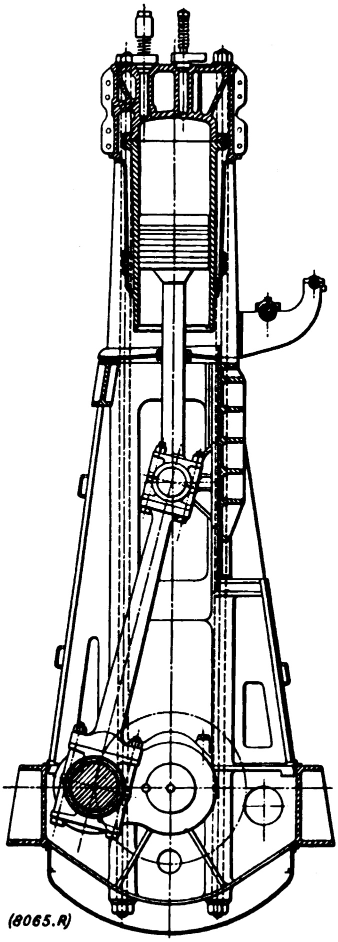
* See the "Annual" for 1921–22, page 232.

LIST OF BRITISH LARGE MARINE OIL ENGINE MANUFACTURERS.

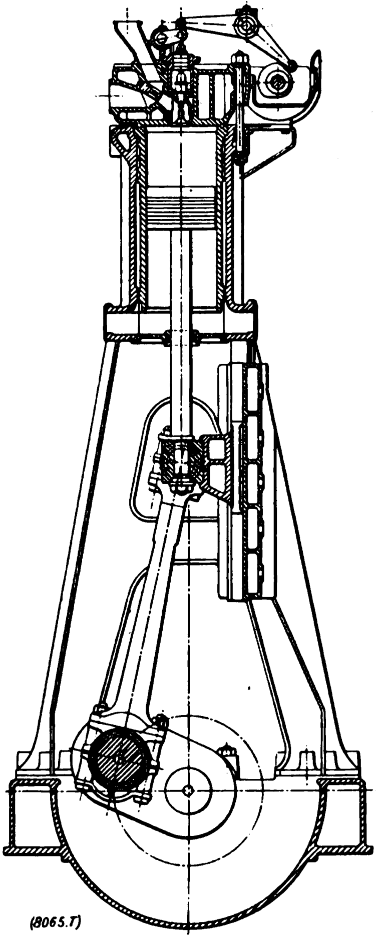
Type of Engine.	Description of type.	Construction.
"Beardmore-Tosi" . .	4-stroke cycle, single-acting	W. Beardmore & Co., Ltd., Dalmuir. Richardsons, Westgarth & Co., Ltd., Hartlepool.
"Burmeister and Wain"	4-stroke cycle, single-acting, and 4-stroke cycle, double-acting	Harland & Wolff, Ltd., Belfast and Glasgow. John G. Kincaid & Co., Ltd., Greenock.
"Camellaird-Fullagar"	2-stroke cycle, opposed piston	Cammell, Laird & Co., Ltd., Birkenhead. John Brown & Co., Ltd., Clydebank. Palmers Shipbuilding & Iron Co., Ltd., Jarrow. David Rowan & Co., Ltd., Glasgow. Smith's Dock Co., Ltd., South Shields. Dunsmuir & Jackson, Ltd., Glasgow.
"Doxford"	2-stroke cycle, opposed piston (solid injection)	W. Doxford & Sons, Ltd., Sunderland. Fairfield Shipbuilding and Engineering Co., Ltd., Glasgow. Richardsons, Westgarth & Co., Ltd., Hartlepool. Workman, Clark & Co., Ltd., Belfast.
"Neptune" (Polar) . .	2-stroke cycle, single-acting	Swan, Hunter, & Wigham Richardson, Ltd., Wallsend-on-Tyne.
"N.B. Diesel" . . .	4-stroke cycle, single-acting 2-stroke cycle, double-acting	North British Diesel Engine Works, Ltd., Glasgow.
"Still"	Combined oil and steam. 2-stroke cycle, double-acting 4-stroke cycle, double-acting	Scott's Shipbuilding & Engineering Co., Ltd., Greenock.
"Sulzer"	2-stroke cycle, single-acting	Armstrong, Whitworth & Co., Ltd., Newcastle. A. Stephen & Sons, Ltd., Glasgow. Fairfield Shipbuilding and Engineering Co., Ltd., Glasgow. Wallsend Slipway and Engineering Co., Ltd., Wallsend-on-Tyne. Workman, Clark & Co., Ltd., Belfast. Wm. Denny, Bros. & Co., Ltd., Dumbarton.
"Vickers"	4-stroke cycle, single-acting (solid injection)	Vickers, Ltd., Barrow-in-Furness.
"Werkspoor" . . .	4-stroke cycle, single-acting	North-Eastern Marine Engineering Co., Ltd., Wallsend-on-Tyne. R. W. Hawthorn, Leslie & Co., Ltd., Newcastle.

the cylinders are isolated from the crank-case by a bottom cylinder cover or diaphragm plate incorporating a gland through which the piston rod passes. This diaphragm prevents any contamination of the crank-case lubrication system by carbonised oil falling from the piston and its rings, or due to any slight water leakage which may occur from the telescopic pipes of the piston cooling gear.

Alongside it is shown the four-stroke-cycle Beardmore-Tosi design, in which there are a number of special features. The combined inlet and exhaust arrangements in the cylinder head are illustrated on page 267. Two small valves, each of only half the normal area of opening of the usual four-stroke-cycle valves, serve equally for the inlet of fresh air and the discharge of the products of combustion. On the completion of the exhaust stroke, a flap valve, hitherto covering the inlet air passage and operated by a simple eccentric from the



BURMEISTER AND WAIN LONG-STROKE ENGINE.



BEARDMORE-TOSI LONG-STROKE ENGINE.

camshaft is changed over and closes the exhaust ports, so that the subsequent downward stroke of the piston draws in across both valve faces fresh air from the atmosphere.

Experience has shown that this flap valve, named the "director valve," can be quite clear all round and in every position of the cylinder head and so cannot stick or seize.

The advantages of this arrangement are manifold. The inlet and exhaust valves are so small that the cylinder head is very easily provided with ample water-cooling spaces, particularly in the centre around the fuel valve, without complication. The fact that only small holes in the head are required to accommodate these valves ensures a very large factor of safety for the head when under load. Heat stresses in the cylinder head are minimised, because instead of one valve (the exhaust) being very hot and the other (the inlet) cold, both are at the same temperature and are much cooler than the average type of exhaust valve. The difference of temperature, therefore, in the bottom wall of the cylinder head and the consequent stresses are very slight. Being relatively cool and swept each cycle by an incoming rush of cold air, the formation of carbon on the valve faces, the consequent pitting and necessity for re-grinding the seats, are very remote contingencies, and only arise due to derangement of the combustion mechanism. With long-stroke engines of this type, cylinder heads of the normal type can be retained, ample room still remaining for large water passages around all the valve pockets. This system is working excellently on service.

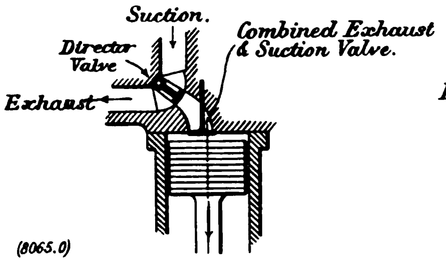
There are certain classes of relatively small vessels where the large crosshead type of engine is considered almost inadmissible because of the weight, the space occupied, and the first cost. For this duty there is a trunk piston engine, as shown on page 268 (by Messrs. Burmeister & Wain). With lubricating-oil-cooling of the piston, no difficulty is experienced in cooling these pistons of relatively small size. The disadvantages of the trunk design which cannot be eliminated—such as the extra wear on the cylinder liner, the increased lubricating-oil consumption due to crank-case oil working up into the combustion chamber, and the inevitable contamination of the main forced lubrication system due to the carbon falling from the main piston—may be minimised by careful design, and are an offset to a smaller and cheaper engine. For certain types of vessel engines of this type are to be advocated.

Mechanical injection of the fuel into the working cylinders, where the pressure of the liquid combustible alone serves to secure sufficient atomisation for ready ignition and good combustion, cannot be said to be extending in application to any appreciable extent. The Vickers and the Doxford systems are performing well, and the latest Vickers engine is shown on the Plate facing page 253.

TWO-STROKE-CYCLE ENGINES.

Progress has also been made with leading types of two-stroke-cycle engines—the Cammellaird-Fullagar, the Doxford, the Neptune, and the Sulzer. In this country the double-acting two-cycle engine

BEGINNING OF FIRING STROKE.
PISTON ON TOP-CENTRE. BOTH VALVES CLOSED



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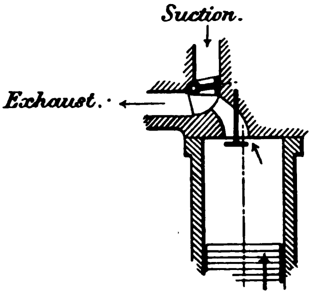
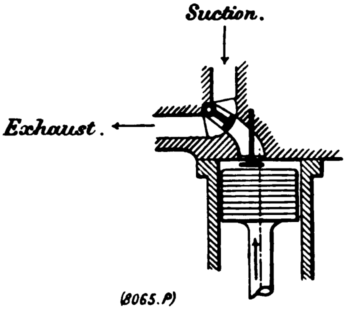
EXHAUST STROKE. PISTON ASCENDING.



END OF EXHAUST STROKE. PISTON ON TOP-CENTRE.
"DIRECTOR VALVE" CLOSES CYLINDER PASSAGE.
COMBINED SUCTION & EXHAUST VALVE STILL OPEN.



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SUCTION STROKE. PISTON DESCENDING.

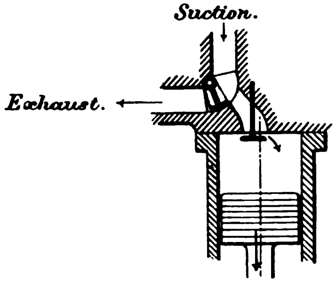
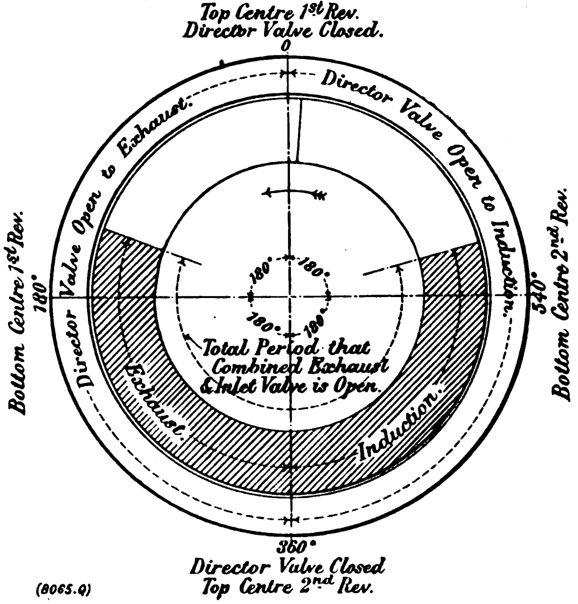


DIAGRAM OF COMPLETE CYCLE. 2 REVOLUTIONS ON CRANK SHAFT BASIS.



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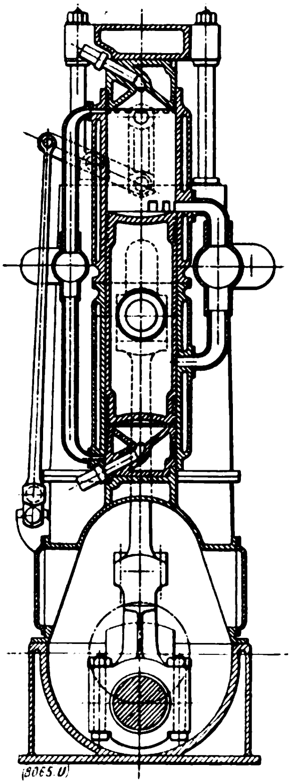
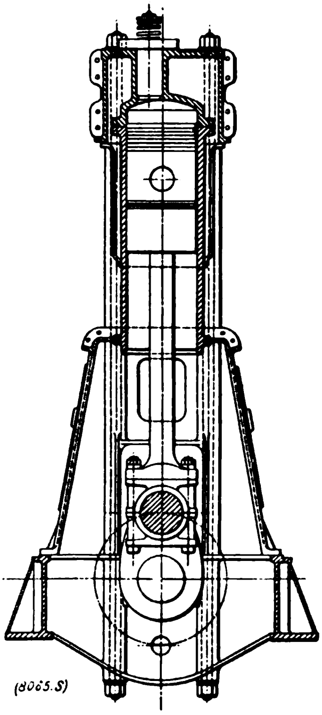
Beardmore-Tosi Inlet and Exhaust System.

makes little headway, although experiments on the test bed ashore are, it is believed, in train with the M.A.N. type engines of 900 B.H.P. each, originally installed in the M.S. "Fritz." This ship was handed over to us by the Germans after the Armistice. The Germans are still pursuing this line of development.

In order to achieve double action without the complication of a bottom cylinder head with a gland for the piston rod, and the difficulties of ensuring good combustion in the bottom combustion chamber, through which the piston rod must pass, a bold and most novel design of engine has been produced by the North British Diesel Engine Company of Glasgow, as shown on this page. At present there is under test at the makers' works a twin-screw set of machinery of this design for Messrs. Furness, Withy & Co., Ltd., who are amongst the most enterprising of shipowners in adopting and trying out various types of marine oil engines. They will shortly have at sea a number of motor vessels in addition to the successful M.S. "Dominion Miller," with three distinctly different types of machinery. The North British Diesel engine has three cylinders each of 24½ in. diameter, 44 in. stroke, and running at 100 revolutions per minute



NORTH BRITISH DIESEL COMPANY'S DOUBLE-ACTING ENGINE.



BURMEISTER AND WAIN TRUNK PISTON ENGINE.

develops 2,000 B.H.P. (see Table in the Merchant Shipping Reference Section).

The leading feature of this design is the reciprocating cylinder, which is actuated by links and levers from the main crosshead at a relatively low linear velocity, and not from a weigh shaft as shown in the diagram. By its reciprocating motion this cylinder brings into communication with the combustion chambers, at the top and the bottom, scavenging air ports. The two sets of exhaust ports are in the centre and are uncovered by the piston. End-to-end scavenge of the products of combustion, as is desirable for the highest efficiency, is achieved. The two sets of exhaust ports eliminate one disadvantage of the normal two-cycle double-acting engine, where the one row of ports must deal with the double quantity of exhaust gases and so attain to high temperatures. A double-headed piston reciprocates inside the cylinder, with a central gudgeon pin to the ends of which the forked connecting rod is attached. The cylinder heads carrying the fuel injection valves are fixtures to the engine framing. The reciprocating cylinder entails sliding joints for the exhaust, scavenging air, water, etc., connections.

It will be appreciated that all the main parts of this engine are remarkably unrestrained and free to expand, so that stresses due to unequal expansion should be minimised. This unique design marks an extremely bold bid to achieve economy of the materials of construction, and gives a compact and light engine.

The Scott Still engine, utilising steam, generated by the heat of combustion in the main cylinder and by the exhaust gases, on the underside of the main piston, is another interesting example of two-stroke-cycle double action. Engines of this type are now being fitted on board a Holt liner, and illustrated as already referred (Plates facing pages 227 and 263). (See also Table in the Merchant Shipping Reference Section.)

MOTOR PASSENGER LINERS.

The dominant feature of the year 1923, where marine Diesel engines are considered, is the application of this latest entrant into the marine field to the propulsion of important passenger vessels. This is the greatest step to date in the history of this prime mover. In the case of these liners a very modest estimate of the running expenses on the intended trade route has indicated such very extensive savings per annum that a decision to adopt other than oil engines for propulsion would have seemed almost a retrograde step. The absence of the usual boiler uptakes and the saving in space of machinery have made possible very fine accommodation for the passengers in a ship of this size.

In the case of the liner building by the Fairfield Shipbuilding and Engineering Co., Limited, Govan, for the Union Steamship Company of New Zealand, and illustrated on the Plate facing page 222, there are four screws, each propelled by a six-cylinder Sulzer-type engine of 3,250 B.H.P., running at 135 revolutions per minute. The innovation in this case is rather in the multiplication of units than in their intrinsic power.

Still more revolutionary is the machinery under construction for the Swedish-American liner, where 13,500 B.H.P. will be developed on two shafts by six cylinders per shaft. Each cylinder of 31½-in. diameter develops 1,125 B.H.P. This machinery is designed on the basis of the exhaustive trials of a single-cylinder unit working on the four-stroke-cycle double-acting principle at the works of Messrs. Burmeister & Wain at Copenhagen. The part played by this firm in the development of the marine oil engine is historical. Confidence, therefore, must be entertained that this advance will be consolidated, and that a new era is opening up for the construction of high-powered marine oil engines.

MAINTENANCE.

There is as yet obviously no narrowing of the issue towards the same standardisation with oil engines at sea as with the steam reciprocator. It is certain, as already mentioned, that the same first principles as have compelled the gradual emergence of the standard steam engine will determine eventually the development of its greatest rival and likely successor. In respect of fuel economy there is so little to choose between the various systems that any gain with one may quickly be negatived by quite a small loss in another direction. The prime factors are reliability with minimum maintenance charges. Carefully analysed it will be found that the leading features of the steam engine that have become standardised represent the very best method of accomplishing their duties, with the greatest ease of inspection, overhaul, renewal, and repair, irrespective, in these regards, of the first cost of construction involved.

With the various types of oil engines accessibility, ease of replacement have very different values, and, with some types, often it may be found that a certain component, common to all, which by virtue of its design requires least frequent attention, is in fact very accessible, due to marine experience having proved the advantage of this provision. This is only instanced to enforce the absolute necessity for accessibility. So rapidly are shipowners gaining experience at sea with the Diesel oil engine, that they will very shortly be able to contribute very largely to the best solution of the various maintenance problems, when they will better appreciate the reasons for the extra size and weight involved in some solutions as compared to the similar influences of others.

The outstanding success at sea up to date of the simple, heavy, large, four-stroke-cycle, single-acting engine is due as much to its low cost of maintenance as to any other causes.

The principal factors contributing to this end are, the simple tube liner with low stresses, ensuring long life (ten years) and the cheapness and simplicity of replacements; the minimum risk of water leakage into the cylinder; isolation of the crank chamber from the working cylinder preventing contamination of the principal bearings with carbon and water, and making for low lubricating oil costs per annum; and large bearing surfaces for the very intermittent load, ensuring with forced lubrication long periods of running without adjustment.

NUMBERS OF PARTS IN TWO-CYCLE AND FOUR-CYCLE ENGINES.

	Normal running.		Manœuvring.	
	4-cycle.	2-cycle.	4-cycle.	2-cycle.
Main cylinders	12	8	12	8
Scavenging blowers	0	1	0	1
Auxiliary cylinders	2	4*	4	8*
„ scavenging pumps	0	1	0	2
Main compressors	2	2	2	2
Auxiliary compressors	1	1	1	1
Total	17	17	19	22

* Larger auxiliary cylinders for two-cycle engine.

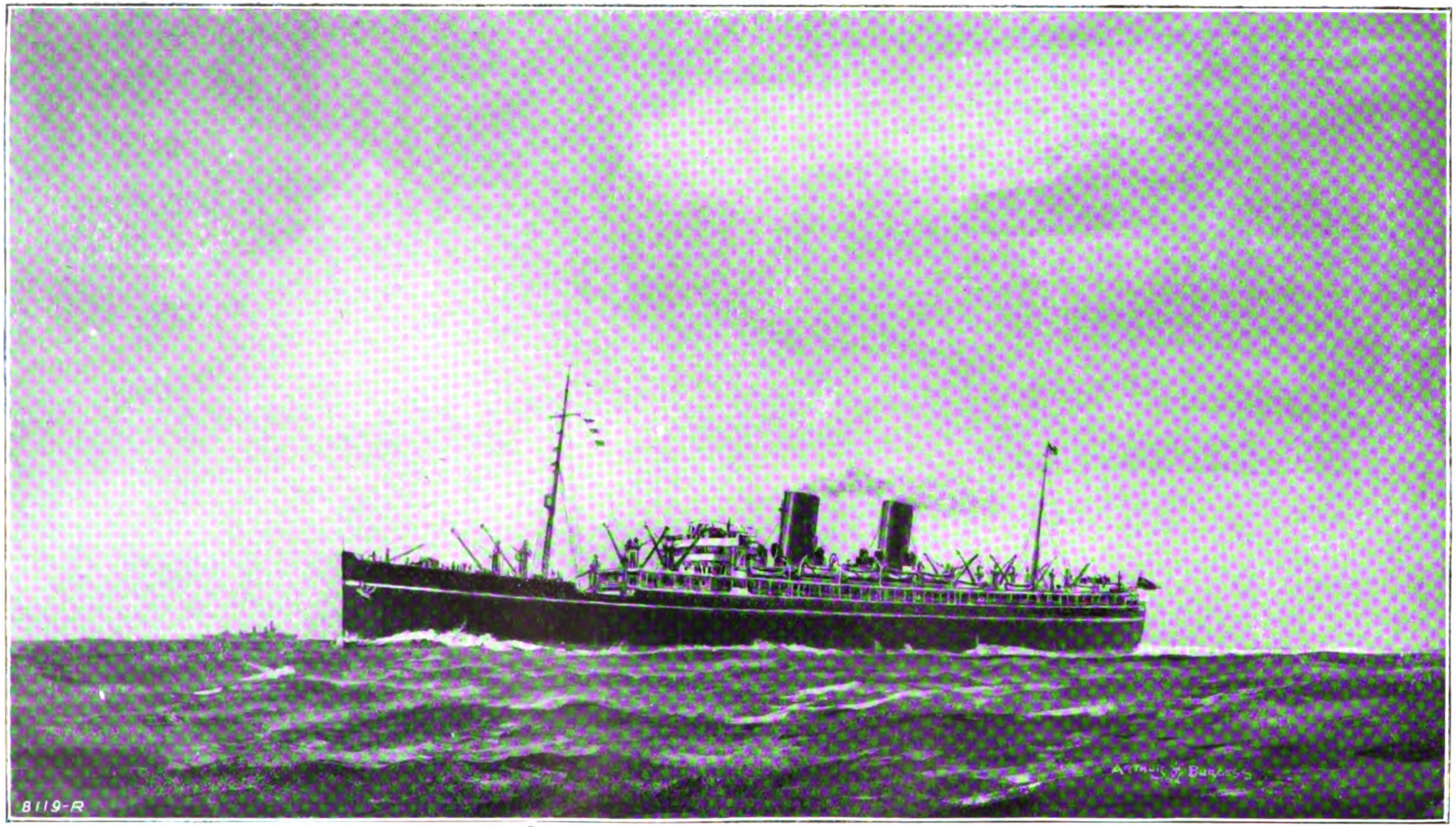
It has been claimed that there are fewer running parts with two-stroke-cycle machinery than with its older rival, the four-stroke cycle. The table above shows that normally there are the same number, but that, when manœuvring ship, the four-stroke cycle has the advantage. The main engine must not be separately considered, but the auxiliaries necessary for its operation must be fully taken into account as has been done in this table.

One disability suffered up to the present time by the motor ship was the requirement of the classification societies which called for the opening up of a specified proportion of the main items of the main and auxiliary machinery every year, requiring, in most cases, the laying up of the ship for a certain period per annum. Now, every two years suffice, and arrangements can generally be made in the case of most vessels whereby on each sojourn of any duration at a home port some part of the survey can be accomplished, and will stand for the two succeeding years.

The influence of the personnel on the question of running costs and maintenance is very considerable, and there are not yet sufficient certificated motor engineers to meet the ever growing demand. Hitherto the Board of Trade have dealt leniently with the question, in order in no way to hamper development. From January 1, 1924, however, the first and second engineers of every foreign-going motor ship of the specified horse-power must hold either a motor certificate, a steam certificate endorsed for use on motor ships, or a special Board of Trade permit. This permit, which must be applied for by the shipowner, will, it is certain, not be unreasonably withheld. So to do would penalise the motor ship, but at the end of the year it will not be readily renewed, unless good cause and reason can be advanced by the engineer to show why his steam ticket has not been endorsed.

Many other of the aspects of the motor ship might be dealt with, but sufficient has been written to give, it is hoped, a clear idea of the trend of this development—the greatest since the introduction of the mechanical propulsion of vessels. A new era has commenced, and when conditions the world over become more stable with the consequent improvement in trade, much new tonnage must be ordered. The supremacy of the British Empire in the trade of carrying the world's merchandise can only be maintained in the face of greatly increased competition, arising from the conditions due to the war, if efficiency is maintained. The British shipowner can be assured that the progress in the design and construction of marine internal combustion machinery, made during the last few years, has been successful in placing British marine engineers well in the forefront. Every known type of machinery is available from which to chose, but the industry must look to the shipowner for encouragement and support. Orders for machinery placed abroad can only have one result—the stultifying of home industries; gradually the shipowner, in his turn, would suffer. Surely those great qualities of initiative, enterprise, and above all courage, which have built up British shipowning and shipbuilding will again rise supreme, and lead to a return of prosperity in all departments catering for the carrying of the world's cargoes.

JAMES RICHARDSON.



(*From a drawing by Arthur J. W. Burgess.*)

PENINSULAR AND ORIENTAL LINER MOOLTAN.

(*Constructed by Messrs. Harland and Wolff, Ltd., Belfast.*)

CHAPTER V.

THE PORT OF LONDON: ITS PAST AND ITS FUTURE.

On account of its antiquity, the early history of the Port of London has become obscure, and at what date sea-going traffic was first attracted up the River Thames remains the subject of much controversy. A free translation of the earliest historians, however, would make London a shipping port 2,000 years ago. Situated on its broad and deep river at a distance of about 60 miles from the sea, and therefore in comparative security and yet within easy distance of the Continent, London enjoys exceptional advantages, and these were undoubtedly the predominant factors in its rise to prosperity, with the result that it has for long been the greatest port in the world, whether judged by the volume of tonnage of shipping entering the river, by the weight and value of the commodities imported and exported, or by the extent of its international markets.

EARLY HISTORY OF THE PORT.

During the Roman occupation, London became a depôt for luxuries required by the Roman settlers and for the export of corn to the legions on the Rhine, and it is probable that much of the artificial embankments by which the river was confined to its present channels were constructed under their superintendence. In the reign of Ethelred, Billingsgate is mentioned as being resorted to by the Easterlings coming with their ships, and was the first place appointed for payment of King's dues. Later Queenhithe was appointed by the Crown for the discharge of corn from the Cinque Ports and fish brought in vessels not belonging to the citizens of London.

A large amount of the commodities brought into the Port of London, however, were bought and sold on the vessels in which they were imported, and in 1236 we have the first record of any landing and wharfage dues when the foreign merchants of London agreed with the citizens to pay to the Mayor fifty marks annually for the privilege of landing and storing the woad imported by them.

Wines were also sold on board the ships lying in the river, but in 1300, the merchants of Bordeaux complained of difficulties in selling and storing their wines in London, and very large houses with cellars were erected, by order of the King, on the river-bank at a place subsequently known as "The Vintry."

EARLY DEVELOPMENTS.

There is ample evidence to show that the trade of London made considerable progress during the 400 years following the Norman Conquest, notwithstanding the numerous and costly wars which had taken place both at home and abroad; but in the reign of Henry VII., and later of Queen Elizabeth, the growth of the foreign trade was so great that the commercial and financial centre of Europe was transformed from Antwerp to London. The important commercial treaties entered into by Henry VII. with the Danes, Italians, and Dutch, the discovery during his reign of the New World and Newfoundland, the final abolition in 1597 by the Queen of the exclusive privileges of the strong and arbitrary Hanseatic League, a confederacy of German merchants from the Baltic with extensive accommodation at the Steel Yard, and the destruction of Antwerp by the Spaniards in 1585 were all contributory factors.

WHARVES AND LANDING-PLACES.

Billingsgate and Queenhithe were, as already stated, recognised landing-places at which H.M. Customs were collected from the earliest times, but as trade increased, it had become necessary to permit other wharves and landing-places to be similarly used. Attempts to evade payment of the dues, however, became so prevalent, that Elizabeth, under an Act of 1558, compelled all goods to be landed and shipped between sunrise and sunset in such places as should be appointed by a Royal Commission. Amongst these, Billingsgate was appointed only for fish, corn, salt, stones, victuals, and fruit; Three Cranes for wine and oil and together with Johnson's Quay and Busher's Wharf for pitch, tar, flax, etc.; the Bridge House for corn and other provisions; the Steelyard for Merchant Strangers free of that Guild, and seventeen other quays and wharves for all kinds of goods. Wood, coal, and beer were allowed to be discharged at any place in the presence of the searcher.

At a later date it became necessary to make new arrangements respecting the wharves and landing-places, and in 1665, under statutory powers, the Commissioners of Customs set out twenty-one "Legal Quays" between London Bridge and the Tower, of a total river frontage of 1,464 feet, and settled for the first time the precise limits of the Port of London, namely, from the North Foreland to London Bridge. These legal limits, however, must not be confused with the Port of London as defined for the conservancy of the River Thames, which will be referred to later. The Commissioners were also empowered to permit with their special "sufferance" other wharves and landing-places to be used under certain conditions.

DIFFICULTIES DUE TO CONGESTION.

From this time until the dawn of the nineteenth century, the trade of the port grew and expanded in all directions. The value of the imports and exports at the Port of London, which amounted in 1704 to about 10 million sterling, had risen by 1794 to nearly 31½ millions, and the number of ships which entered coastwise and from foreign ports rose from 6,500 to about 13,500 per annum, and their aggregate tonnage from about 425,000 to over 1,600,000 per annum.

During this period, however, the accommodation provided failed to keep pace with the expansion of trade, with the result that the conditions became so bad as seriously to imperil the prosperity of the port. To cope with the trade which had increased between three and four times in a period of ninety years, there existed the legal quays only 1,464 ft. in length, which had not been extended since the reign of Charles II., the suffrance wharves representing a total of 3,675 ft., and moorings in the river between London Bridge and Deptford, which were frequently occupied to the extent of 50 per cent. above their proper capacity. It must be remembered also that the arrival of the ships was not spread more or less evenly throughout the year as it is to-day. Every distant port had its shipping season, which, coupled with delays due to storm, frequently resulted in huge fleets arriving in the Thames simultaneously; in consequence, cargoes would often remain either in the vessels themselves or in lighters for weeks on end. The quays were similarly congested, and it is therefore small wonder that wholesale plundering became general. Lightermen, watermen, seamen, and even Revenue Officers took part, whilst the sides of the river were infested with receiving houses. It is estimated that the value of merchandise and tackle stolen in 1797 amounted to £506,000, and the Marine Police, which were established in that year, were successful in recovering stolen property worth upwards of £100,000 during the first twelve months.

Improvement Schemes.

In 1762, and again in 1765, the Crown appointed Commissioners with a view to extending the Legal Quays, but their efforts were frustrated by vested interests, with the result that conditions on the river went on growing from bad to worse without anything being done. From 1793 until 1799, when the Bill for the construction of the West India Docks received Royal Assent, a number of schemes for improving the accommodation of the port engaged the attention of the mercantile community and Parliament, and in 1796 a Committee of the House of Commons was set up to receive evidence, consider, and report on the proposals.

Included in the eight schemes considered, was a proposal to cut a new channel for the river from Wapping to Woolwich, making the bends into enclosed docks, but the general consensus of opinion was in favour of the construction of wet docks, both for the better security of shipping and of goods and merchandise as well as to relieve the congested state of the river, which had become so great as to render it impossible to keep the necessary channels clear for navigation. It should be mentioned, however, that the idea of enclosed wet docks was by no means new, for extensive docks already existed in Liverpool, others at Bristol, Hull, etc.; and, in fact, on the Thames, where a wet dock 10 acres in extent, with an entrance lock 150 ft. long and 44 ft. wide, was constructed at Rotherhithe under an Act of 1696. This dock, which was known as the Howland Great Wet Dock, appears to have been used originally for the fitting out of ships, and after its sale in 1763 it was adapted for the whaling industry, boilers and tanks being erected for the extraction of oil from the blubber. In 1789 the construction of the Brunswick Dock, of an area of about 8 acres, was undertaken at Blackwall by a Mr. Perry, for the accommodation and protection of vessels of the East India Company.

The Construction of the West India Docks.

The docks referred to above, however, had their own special uses and so far as providing accommodation for the trade of the port was concerned, their effect may be considered negligible. The foundation stone of the West India Docks, the construction of which may be said to mark the commencement of the Dock Era in the port, was laid on July 12, 1800, and the Import Dock opened to traffic by William Pitt, the then Prime Minister, on August 27, 1802. The enabling Act, "for rendering more commodious and better regulating the Port of London," provided for the incorporation of the West India Dock Company, the raising of capital stock, and the limiting of their dividends to 10 per cent. On the other hand, for a period of twenty-one years all ships from the West Indies were required to discharge in the docks and vessels bound for the West Indies to load therein or else in the river below Blackwall. Under the same Act, the Corporation of London were empowered to construct a canal, afterwards known as the City Canal, across the Isle of Dogs and to grant licences to build on the adjacent ground. This canal, however, proving unsuccessful, was sold in 1829 to the West India Dock Company and, until converted into the South-West India Dock in 1870, was used as a timber pond and for the accommodation of grain.

Docks at Wapping and Millwall.

Scarcely a year from the passing of the Act referred to, namely on June 20, 1800, Parliament sanctioned the construction of the London Docks at Wapping, for vessels bringing tobacco, rice, wine, and brandy elsewhere than from the East Indies, for which trades a monopoly of twenty-one years was also granted. Their construction was commenced in 1801, and the docks were opened for traffic in 1805. In 1803 powers were obtained for the construction of the further series of docks at Blackwall for the accommodation of the East India shipping, where all produce arriving in the Thames from the East Indies or China was required to be discharged for a period of twenty-one years, and all outward-bound vessels to those parts were to take in their cargoes in those docks or in the river below Limehouse Reach. The docks, which were commenced in August 1803, and opened three years later, comprised the Import Dock, Export Dock, and the western portion of the present basin, Mr. Perry's Dock being absorbed in the second named. It is here worthy of mention that East London is indebted solely to the East and West India Dock Companies for two of the finest roads in the Metropolis even to-day, namely, the Commercial Road and the East India Dock Road, which were constructed at a cost of £120,000.

HISTORY OF THE SURREY COMMERCIAL DOCKS.

On the south side of the river, the Howland Great Wet Dock (afterwards the Greenland Dock), on the decline of the whaling trade, was sold, in 1806, and used for the reception of ships laden with timber, deals, tar, corn, etc. The Surrey Commercial Docks, as they are known to-day, were, however, up to 1865, the property of two separate and rival companies; broadly speaking, the Commercial Company being the proprietors of the eastern portion, and the Grand Surrey Docks and Canal Company of the western portion. The first named, which was formed in 1807, purchased the Greenland or Commercial Dock, and in 1810 obtained their first Act of Parliament, shortly ofterwards opening the Norway Dock, Lady Dock, Acorn Pond, and Lavender Pond. The Grand Surrey Canal Co. was incorporated under Act of Parliament in 1801, and proceeded to construct a basin and entrance lock for ships at Rotherhithe and a canal leading therefrom to Camberwell and Peckham.

THE ST. KATHARINE AND THE VICTORIA DOCKS.

Whilst the monopolies of the three great Dock Companies on the north side of the river continued, they flourished exceedingly; their rates were at the maximum and their dividends proportionate. Consequently, when their privileges were about to expire, it was natural that others should seek to participate in the profits, and, in 1823, a company of merchants sought powers to enable them to construct docks between the London Docks and the Tower. After much opposition from their neighbours, the London Dock Company, an Act was obtained in 1825, and the St. Katharine Docks, the first "free" docks in London, were opened in 1828. From this period no great extension of the dock system took place until 1850, when, in consequence of the enormously increased shipping trade, an application was made to Parliament for the construction of the Victoria Docks. These large docks, 93 acres in extent, are interesting as being the first at which hydraulic machinery was used for the handling of cargo, and the first at which railway facilities were provided. Further, they marked the beginning of renewed activity in dock construction on the Thames and of a prolonged struggle for supremacy between the rival companies, which continued for a period of over thirty years.

Between 1852 and 1862, the Globe Pond, South Dock, South Entrance Lock, and Lavender Entrance Lock were completed by the Commercial Dock Co., and between 1858 and 1861 their rivals, the Grand Surrey Canal Co., opened the Centre Pond, Surrey Lock, Surrey Basin, Albion Dock, and Albion Pond, but further competition was avoided by an amalgamation of the two companies in 1865, under the name of the Surrey Commercial Dock Co.

On the north side of the river the London Dock Co. constructed Shadwell Basin and Lock in 1858, but, in 1864, amalgamated with the St. Katharine Dock Co., and purchased the property of the Victoria Dock Co., which had been built by private enterprise. In 1864 also, a further company was formed, known as the Millwall Dock Co., who constructed, and opened in 1868, the Millwall Docks. Almost simultaneously, the East and West India Companies, who had amalgamated in 1838, carried out extensions to their systems, and in 1870 completed the conversion of the old City Canal into the South-West India Dock, and shortly after opened the extension of the East India Dock Basin and a new Entrance Lock.

THE ROYAL ALBERT DOCK.

Ten years later, the London and St. Katharine Dock Co. completed the great extension at Galleons, known as the Royal Albert Dock, which succeeded in attracting several lines of steamers from the docks of the East and West India Docks Co., who retaliated by constructing the fine docks at Tilbury, opened in 1886. Owing, however, to their distance from the City, the last-named docks obtained but little support for some years, and in order to attract shipping substantial inducements were offered, which, of course, re-acted on the others. It will be sufficient to state here that the destructive competition was ended by the companies coming to an understanding in 1888, and finally their amalgamation, under the name of the London and India Dock Co., took place in 1901. From 1886 until the advent of the Port Authority, a period of twenty-three years, no improvements of any magnitude were carried out, with the exception of the enlargement of the Greenland Dock and the construction of a new entrance lock in 1904, notwithstanding that the trade of the Port continued to increase and with it the size of the vessels themselves.

THE CREATION OF THE PORT OF LONDON AUTHORITY.

Towards the close of the nineteenth century much concern was publicly felt at the lack of a progressive policy in the port and the failure of those responsible to keep abreast of the times, both in respect to the docks and their equipment, and also the navigable channels of the river. Until 1857, the River Thames, by very ancient Charters and Acts, was under the control of the Corporation of London, whose jurisdiction extended from Staines to Yantlett Creek. In the year mentioned, the Thames Conservancy Act was passed, under which extended powers were granted, over the whole of the river from Cricklade in Wiltshire to Yantlett Creek, to a statutory body known as the Thames Conservancy, who, however, eventually found themselves without means of raising sufficient funds to deepen and improve the river in order to keep pace with modern requirements. In consequence, the Government set up a Royal Commission, in 1900, to investigate the whole matter, and found that there existed a general censensus of opinion in favour of the creation of a single Public Authority for the control and improvement of the port. A Bill embodying the recommendations of the Royal Commission was introduced into Parliament in 1903, but was subsequently dropped. The Government, however, continued their investigations, and in 1908 announced that they had decided to take over the properties of the various Dock Companies at a collective valuation of £23,000,000, and to hand them over, together with the tidal portion of the River Thames between Teddington and the sea, to a Public Authority to be created. A comprehensive Bill for this purpose was passed through the House of Commons in July, 1908, and finally the Port of London Authority came into being as from March 31, 1909.

Briefly stated, there were handed to the new Authority nearly 70 miles of the river, 24 miles of dock quays, enclosing 640 acres of water, over 130 miles of passenger and goods railways, and three miles of canal, together with all duties and obligations relating to the management, control and development thereof, except the lighting, buoying, and policing of the river and duties under the Public Health Acts.

PROGRAMME OF IMPROVEMENTS.

Almost immediately on assuming control, the Authority made an exhaustive inquiry into the adequacy of the accommodation and facilities in the port afforded by the undertakings transferred to them, which resulted in a comprehensive programme of improvement and extension works being drawn up. The importance and magnitude of the problem before the Authority may best be illustrated—bearing in mind that no works of any magnitude had been undertaken in the port for the past quarter of a century—by the fact that during the previous fifty years the tonnage of vessels which entered the Port annually steadily increased from about 6,000,000 to about 18,000,000 net register, and the average dimensions of the twenty largest vessels in the world had during the same period increased from 350 ft. in length with a beam of 43½ ft., a draft of 23½ ft., and a gross tonnage of 2400, to 700 ft. in length, with a beam of 77 ft., a draft of 35½ ft., and a gross tonnage of 24,500.

The programme was divided into three categories, according to urgency, and several important works were immediately put in hand. So far about 10¼ millions stirling have been expended on improvements and extensions and the whole of the works comprised in the primary, or most urgent, programme are now complete, together with additional works of considerable magnitude, the immediate necessity for which has from time to time been proved.

IMPROVEMENTS OF NAVIGABLE CHANNELS.

The pressing necessity of dealing with the problem of the navigable channels to provide for the largest class of vessels was early realised by the Authority, and steps were immediately taken to carry out dredging to the following widths and depths:—

From the Nore to Cold Harbour Point, a channel 1,000 ft. wide and 30 ft. deep at low water.

From Cold Harbour Point to the Royal Albert Dock, a channel 600 ft. wide and 30 ft. deep at low water.

From the Royal Albert Dock to the Greenland Dock, a channel 600 ft. wide and 20 ft. deep at low water.

From the Greenland Dock to the Thames Tunnel, a channel 500 ft. wide and 16 ft. deep at low water.

From the Thames Tunnel to Tower Bridge, a channel 500 ft. wide and 14 ft. deep at low water.

From the Tower Bridge to London Bridge, a channel 450 ft. wide and 14 ft. deep at low water.

The dredging fleet taken over from the Thames Conservancy, consisting of 4 dredgers and 8 steam hoppers, was augmented for the purpose by the construction of 4 bucket dredgers and 15 steam hoppers at a cost of £500,000. Progress with the work was considerably curtailed due to the Great War, but, so far, over 26,000,000 cubic yards of material have been dredged and deposited at sea.

The rise of the tide from low water on spring tides to high water on neap tides varies from 15 ft. 6 in. at Southend to 17 ft. 2 in. at London Bridge, so that when the dredging is completed there will be ample depth for the largest vessels.

THE LONDON AND ST. KATHARINE DOCKS.

The combined water area of this group of docks, which lies between half a mile and two miles below London Bridge, amounts to 45½ acres and the lineal quayage to upwards of 3 miles. The chief articles dealt with are wool, rubber, ivory, shells, skins, wines and spirits, fruit, tea, coffee, sugar, cloves, and quicksilver, for the showing and storing of which enormous warehouses and vaults are provided. The principal entrance lock, situated at Shadwell, is 350 ft. long, 60 ft. wide, and has a depth of water of 28 ft. on the cill at Trinity High Water.

Owing to the restricted site, no extensions at the St. Katharine Dock are possible, but at the London Docks many important works have been carried out by the Port Authority at a cost of about £300,000, and still further improvements and extensions are contemplated there.

In the Western Dock, a quay and two-storey shed 1,260 ft. long have been constructed on the north side, and from the western side a jetty 783 ft. long and 192 ft. wide, with two-storey warehouses and an equipment of electric cranes up to a capacity of twenty tons thereon. The ships' passage between the Eastern and Western Docks has been widened and deepened and pumping plant installed to raise and maintain the water levels. The future improvement works contemplated at this group of docks, and for which Parliamentary powers have been obtained, include the widening out and deepening of Shadwell Old Basin and the construction of a new quay, with a transit shed and warehouse 400 ft. long by 150 ft. wide, having a cellarage below and a roadway 40 ft. wide at quay level.

SURREY COMMERCIAL DOCKS.

The Surrey Commercial Docks, which have a water area of 165 acres, are situated on the south side of the river, about two miles below London Bridge. For many years they have been the principal centre in London for the soft wood and pitch-pine business, and extensive ponds are available for floated timber. A very large business in Canadian and American produce, such as frozen meat, grain, cheese, etc., is also carried on. The principal entrance is the Greenland Lock, 550 ft. long, 80 ft. wide, and 35¼ ft. deep on the cill at Trinity High Water, by which the Greenland Dock, with a depth of 31½ ft. below the same level, is approached. Altogether nearly 5½ miles of quays are available, apart from the Surrey Canal to Peckham and Camberwell, which has a length of over 3½ miles.

Over 11 acres of covered storage space have from time to time been added by the Port Authority, and a comprehensive scheme of improvements is in process of being carried out, and a contract has recently been let for the construction of a deep-water dock with an area of 15 acres and a depth of 27 ft. below Trinity High Water, which will provide five berths for vessels 400 ft. in length. Suitable sheds, equipment, and road access will also be provided, and the dock, which will be constructed so as to permit of deepening to 35 ft. when desired, will communicate with the Canada Dock by means of a new passage 80 ft. wide. The works referred to above form a portion only of a more extensive scheme of improvement which will follow in instalments, according to requirements.

The depth of water at many of the quays in the older portion of the docks is now insufficient at neap tides for present-day requirements. To remedy this electrically-driven impounding pumps will shortly be installed to raise the water level in the docks and maintain it at all times at Trinity High Water level.

As at the London and St. Katharine Docks, no railway facilities are available within the dock area, although many attempts to secure a connection have been made, unfortunately without success. Negotiations with the railway companies, however, are again proceeding, and it is hoped that direct deliveries will shortly be possible.

INDIA AND MILLWALL DOCKS.

The docks comprised in the India and Millwall group consist of the West India Import and Export Docks, the South West India Dock, the Millwall Docks, and the East India Import and Export Docks and Basin. They have an aggregate water area of upwards of 160 acres and seven miles of quays. The principal commodities dealt with are sugar, rum, grain, frozen meat, hard woods, and general merchandise.

The entrance to the Millwall Docks, 450 ft. long by 80 ft. wide, with a depth of 28 ft. on the cill at Trinity High Water, is situated 3½ miles below London Bridge, while the principal entrances of the West India and East India Docks are at Blackwall, 2 miles lower down. The former is 480 ft. long by 60 ft. wide, with a depth of

30 ft. below Trinity High Water, and the latter has a width of 64½ ft. and a depth of 31 ft.

Many important improvement works have been carried out by the Port Authority in this group of docks. On the north side of the West India Import Dock, a quay 2,450 ft. long with three two-storey sheds has been constructed, and on the north side of the Export Dock, a quay 1,608 ft. long with two single-storey sheds.

At the Millwall Dock, nearly 11 acres of additional shed accommodation have been provided, the dry dock has been extended by 105 ft. to 555 ft. long, and new pumps have been installed capable of de-watering the dry dock in three hours.

At the appointed day when the Port Authority assumed control, the East India Import Dock was practically derelict, owing to insufficient depth of water, the absence of modern sheds and equipment and, in particular, to the inadequacy of the lock between the Import Dock and the Basin, which had not been enlarged since its construction in 1805. One of the first works undertaken was the modernising of this dock by the re-construction of the passage to 80 ft. wide with a depth of 31 ft. below Trinity High Water, the construction of new quays on the north and east sides, and of single and double-storey sheds behind. At the same time, electrically-driven centrifugal pumps were installed for raising and maintaining the water at 2 ft. above Trinity datum. The importance of these works may best be illustrated by stating that, by them, vessels of about 8,000 gross register tons can now be accommodated.

An extensive scheme of improvements, estimated to cost £1,700,000 at pre-war prices, for which Parliamentary powers have already been obtained, is projected for the West India and Millwall Docks. The proposals include a large turning basin at the east end of the Import, Export, and South Docks, with a new entrance lock thereto, 650 ft. long, 80 ft. wide, and 38½ ft. deep at high water of ordinary neap tides, and a communication passage from the Millwall Docks. Vessels up to 625 ft. in length, with a gross tonnage of about 18,000, will then be able to enter all these docks, of which the Import and Export Docks will have depths of 28 ft. of water, the South Dock a depth of 35 ft., and the Milwall Dock a depth of 30 ft. A new dry dock 625 ft. long is also contemplated.

ROYAL VICTORIA AND ALBERT DOCKS.

The Royal Victoria and Albert and King George V. group of docks, which extend for a length of about 3 miles, forms the most important system belonging to the Port Authority. They have a combined water area of 245 acres with 10½ miles of quays, and the area of the estate, including land for extension purposes, amounts to over 1,100 acres. The principal entrance is by the recently completed King George V. Lock at Galleons, situated about ten miles below London Bridge. It has a length of 800 ft., a width of 100 ft., and a depth of 45 ft. below Trinity High Water. The business is in tobacco, frozen and chilled meat, and in general cargoes, for the accommodation of which very extensive warehouses and transit sheds are available.

One of the first improvement works undertaken by the Port Authority was a pumping installation to raise and maintain the water level in the docks at 2 ft. 6 in. above Trinity High Water, thus allowing vessels of greater draft to be accommodated. The pumping station is situated at Galleons and contains three 70-in. electrically-driven centrifugal pumps, capable of delivering 16,875,000 gallons of water per hour. The enlargement of the Western Dry Dock to 575 ft. long by 80 ft. wide, and the installation of new electrically-driven pumping machinery followed, and also the equipment of the north side of the Royal Albert Dock with forty-three electric cranes of the most modern type, capable of lifting 3 tons with a maximum radius of 65 ft.

For the meat business, a quay at the west end of the Royal Albert Dock was equipped in 1911 with the latest appliances for handling frozen and chilled carcases. Two years later the Authority put in hand the construction of very extensive cold storage accommodation which is unrivalled. The works comprised a cold store, a two-storey transit and cold sorting shed, a refrigerating station, and the provision of conveyors, lifts, and other machinery and appliances for rapid handling.

The cold store has accommodation for 250,000 carcases of sheep at a temperature of 15° to 18° Fahrenheit, and the upper floor of the transit and cold sorting shed could, if required, accommodate a further 250,000 carcases. The upper floor, however, is intended primarily for sorting the carcases prior to direct delivery to road, rail, or barge, or to the cold store behind for warehousing. In conjunction with their frozen meat business at the docks, the Authority also increased their accommodation at the London Central Markets, Smithfield, by the construction, in Charterhouse Street, of a cold store capable of accommodating 78,000 carcases, thus bringing their total accommodation up to approximately 1,330,000 carcases.

For the tobacco trade, a new quay on the north side of the Royal Victoria Dock, a six-storey warehouse capable of accommodating 10,000 hogsheads, and an extension of an existing warehouse have been constructed. On the south side of the Royal Victoria Dock, two double-storey and four single-storey sheds, and various other sheds recently erected, have increased the floor storage area at this group by over ten acres.

THE KING GEORGE V. DOCK.

By far the most important work yet undertaken by the Port Authority, however, was the King George V. Dock, opened by His Majesty King George V. in July, 1921. Previously, the largest ship which could be accommodated in the port was limited to about 19,000 gross register tons, and that only at Tilbury, a distance of 26 miles from London Bridge, but by the opening of the King George V. Dock vessels up to 30,000 tons can be berthed within 6½ miles of the heart of the great City warehouses.

The new dock, which has a water area of 64 acres and a depth of 38 ft., is entered from the river by a lock 800 ft. long by 100 ft. wide, with a depth on the cill of 45 ft. below Trinity High Water. By means of a floating caisson, for which provision has been made at the inner end, the effective length of the lock can be increased to 910 ft. The dock is surrounded by quays of an aggregate length of 10,000 ft., thus providing fourteen berths for steamers of the largest dimensions, and is equipped on the north side with three double-storey sheds 1,100 ft. by 120 ft., and on the south side with seven single-storey sheds, 528 ft. by 120 ft., one each behind seven reinforced concrete jetties constructed parallel with the dock wall and at a distance of 32 ft. from it. This latter arrangement enables cargoes to be directly discharged into barges lying between the jetties and the wall by up-to-date cranes placed on the jetties and without causing congestion in the fairway of the dock. Ample road and railway facilities have also been provided within the dock area. The crane equipment includes 66 electric quay cranes of the most modern design, capable of lifting 3 tons each.

At the extreme western end a new dry dock, 750 ft. long (and capable of extension when required), 100 ft. wide at the bottom, and 35 ft. deep on the blocks, has been constructed. This dry dock, as well as the other five large dry docks in the port owned by the Authority, has been equipped with electric cranes to lift up to 25 tons from the centre of the dry dock, and air compressors for operating pneumatic tools for ship repairing purposes. In addition, sites adjacent to the dry dock have been taken by well-known ship-repairing firms, on which extensive repair shops are now nearing completion ; near the entrance lock about 15 acres have been leased for the construction of engineering works on a large scale.

The developments authorised at this group of docks include the construction on the north side of the Royal Victoria Dock of a new quay and a double-storey shed, fitted with runways and other appliances for the sorting, conveying, and loading into road vans, railway trucks, or barges of frozen and chilled meat from the largest class of vessels, and tenders for the work will shortly be invited.

At a later date it is proposed to construct on the north side of the Royal Albert Dock a large new dock, 126 acres in extent and 45 ft. deep, with 3 miles of quay and an entrance lock 1,000 ft. long by 120 ft. wide by 52 deep below Trinity High Water, and two large dry docks.

TILBURY DOCKS.

These docks, situated 26 miles below London Bridge, opposite Gravesend, have an enclosed water area of 72 acres, a maximum depth of 42½ ft. below Trinity High Water and over 3 miles of quays. In addition, a tidal basin, 18 acres in extent, affords protection from the tideway for large vessels entering the lock, which is 700 ft. long, 79½ ft. wide and 44 ft. deep below Trinity High Water on the outer cill, as well as providing three berths for smaller vessels.

The works already completed by the Port Authority at Tilbury include an extension by 17 acres of the main dock, with a depth of 42½ ft. below Trinity High Water, 1,800 ft. of quay, three large transit sheds, modern electric cranes and railways. In the river a two-storey reinforced concrete jetty has been constructed for the discharge of vessels landing part cargoes only. The jetty, 1,000 ft. long and 50 ft. wide, has two floors, the upper of which has been equipped as a quay with railway lines and electric cranes, and the intervening space between the upper and lower floors has been boxed in to form a transit shed. A depth of 30 ft. of water is available for ships lying alongside, and deliveries can be made into barges at the back of the jetty, either direct from the ship or from the upper or lower floors. By means of an approach viaduct at the western end, railway access is obtained to or from the dock railways and the Midland Railway.

Considerable improvements have also been effected at the dry docks, which have been brought up to date by the construction of concrete dams, the provision of new suction-gas pumping plant, an equipment of cranes to lift up to 25 tons, and air compressors for pneumatic tools. Here again important sites have also been let to ship-repairing firms for the erection of extensive works. Altogether the Port Authority have added nearly half a million square feet of shed space to the accommodation at these docks, but the improvements so far carried out form but a small portion of the scheme projected on the Grays side.

When the Tilbury Docks were opened in 1886, the largest vessel using them was the s.s. Orient, 485 ft. long by 46 beam, and a gross tonnage of 5,385; but such progress has been made in the size of vessels that steamship companies using these docks to-day are building new vessels 650 ft. long B.P., with a beam of 75 ft. These are the extreme dimensions which can normally be dealt with in the entrance lock, and much larger than can be accommodated in the dry dock. The largest vessel now afloat is the Majestic, with a length of 915 ft., a beam of 100 ft., and a gross register tonnage of 56,551, and it is contemplated that vessels of even greater dimensions will be constructed in the future.

The Authority, having fully considered the matter, have decided that they must look ahead fifty years and make provision for any ship built, building, or likely to be built, within that period. It is, therefore, intended to commence to construct the first portion of a new dock, which in its completed form will be 6,550 ft. in length and 750 ft. in width. It will have a depth of 45 ft. and contain 15 berths equipped with the most modern sheds and appliances. The entrance lock will be 1,150 ft. long, 130 ft. wide, with a depth on the cill of 56 ft. below Trinity High Water, and the new dry dock will ultimately be of similar width and depth, but its length temporarily will be restricted to 800 feet.

PROPOSED FLOATING LANDING STAGE AT TILBURY.

On the lower side of Tilbury Basin it is proposed to construct in conjunction with the London, Midland, and Scottish Railway Co., a floating landing stage with every convenience for the embarkation and landing of passengers and their baggage. A joint Bill for the purpose has already received Parliamentary sanction, and the work will shortly be put in hand. The landing stage will be 2,000 ft. in length and 80 ft. in width, and will have a depth of 35 ft. alongside at low water of ordinary spring tides. The existing railway station will be enlarged and extended towards the river, and all six platforms will lead on the same level direct to a circulating area about 2,500 yards in extent, whence access will be obtained to and from the liners. A feature of the scheme will be the commodious hall for the examination of passengers' baggage. A service of express trains will be run to and from London, whilst for those who prefer to travel by road, access for motor cars to the water's edge will be provided.

THE NEED FOR ROADS IMPROVEMENTS.

Sufficient has been said to show that no effort has been spared to bring this great Port of London, on which the prosperity of Britain, and indeed that of the Empire, so largely depends, to such a state of efficiency as to fulfil not only present-day requirements, but also to provide for the future expansion of trade, which may be confidently looked forward to.

There is, however, one direction in which no progress has been made for many years, namely, in the improvement of the road and railway facilities to the docks. The Authority view the matter with very grave concern, and are apprehensive lest their efforts in improving and enlarging the docks at an enormous cost should be sterilised by the inadequacy of the facilities for transport without the area of their jurisdiction.

Since 1911, the attention of the Municipal Authorities and the Government has been directed on every possible occasion to the vital necessity of a new road from Canning Town to the Docks and Silvertown, on which the traffic conditions are now intolerable; indeed, it has been admitted to be the most pressing in the whole country, yet nothing has been done.

DEVONPORT.

CHAPTER VI.

WIRELESS DIRECTION-FINDING AS AN AID TO NAVIGATION.

AN examination of the records of the causes of accidents at sea indicates that the majority are primarily due to uncertainty as to the ship's precise position. Any additional means, therefore, which will act as a check on the dead reckoning of a ship will tend to reduce the risk of accident from this cause. Although the wireless direction-finder, when first introduced, was by no means reliable, much progress has recently been made towards its perfection and, with its extended use in the mercantile marine, the initial prejudice so natural to the introduction of any new appliance will gradually disappear.

There are two principal methods of navigation by wireless in use at the present time: Firstly, the establishment of coastal direction-finder stations which take bearings on the wireless waves radiated from a ship's aerial and signal the bearing to the ship, or if working in conjunction with another coastal station obtain cross bearings and signal the actual position from the resulting "fix"; and secondly, the placing of the direction-finder itself aboard ship which enables any number of vessels to take bearings simultaneously on the ordinary coastal wireless stations or on the wireless signals of any other vessel.

COASTAL DIRECTION-FINDER STATIONS.

Dealing first with the coastal direction-finder stations, there are now several of these in existence, and they have proved their value in many instances. Particularly good work is being carried out by the three Canadian direction-finder stations established at Chebucto Head, Canso, and Cape Race. These stations generally work continuously during the heavy traffic season, and the reports from captains of vessels trading in the vicinity seems to indicate that about 90 per cent. of the bearings are accurate and reliable.

Although there are now about eighty-four coastal stations established in various countries, the extent to which they are used seems to indicate that this method of direction-finding is not generally favoured, possibly due to the fact that the authorities operating such stations will not accept any responsibility for the bearings they give, and it is natural that shipowners should prefer that their captains should not have to rely upon the competent operation of the shore station apparatus and calculations carried out by men unknown to them and in whom, therefore, they naturally have not the same confidence as in their own navigating officers.

If the more recent reports on the disaster to the seven American destroyers off the coast of California are to be believed, it would appear that after obtaining somewhat questionable bearings from a coast station, which did not agree with their dead reckoning, all subsequent wireless bearings were disregarded, even though, in fact, they were correct. Had the directional instruments been under the direct control of the navigating officers, it is probable that more confidence would have been shown in the "fixes" and the disaster averted.

There is, however, a still more serious objection to direction-finding by coastal stations. Such stations are usually established in congested areas and are naturally made most use of during foggy weather, when the heavy demand upon their services frequently causes serious delay before "fixes" can be obtained.

The grounding of the s.s. Alaska off Northern California is an example of this difficulty. According to all accounts, this vessel had been endeavouring to get in touch with the shore direction-finding station for over two hours before grounding, but was unable to obtain a bearing on account of the large number of vessels requiring "fixes" in the dense fog. For these reasons, Government authorities are concentrating their attention upon the equipping of lightships with wireless sets which can be employed as beacons for the use of those ships fitted with direction-finders.

Direction-finders on Board Ship.

The placing of the direction-finder aboard ship appears to be the natural solution of the problem. Here it takes its proper position as one of the navigating instruments of the vessel, and experience enables the navigator to judge the amount of reliance which can be placed on observations. Most important of all, frequent bearings can be taken without having to transmit any signal from the ship. Therefore, interference with other wireless traffic is avoided, and there is no delay, for any number of vessels can simultaneously fix their positions by bearings of the shore wireless stations.

Much evidence has already been collected of the value of a ship's direction-finder as a check upon dead reckoning, and the following instance, which has been quoted by Mr. J. Herbert Scrutton, Chairman of Lloyd's Register, is of particular interest:—

> A vessel fitted with one of the Radio Company's direction-finders was homeward bound from North America in thick weather. Wireless bearings were taken off Cape Race when some way out, and it was found that the ship was considerably to the northward of her dead-reckoning position; course was altered and, as a result of other D.-F. observations, was set to pass eight miles from Cape Race. When Cape Race was abeam, by a wireless bearing, soundings were taken which confirmed the distance as eight miles.

This is an excellent example of the manner in which, under conditions when only one wireless station is available for a bearing, other methods of navigation may be used to obtain a "fix" on the wireless position line.

The fitting of direction-finders aboard ship involves some capital outlay, but this is small compared with the saving in running costs which the direction-finder can effect. It is the aim of every shipowner to-day to reduce running costs, and the ability to proceed with the aid of the direction-finder in foul weather will quickly compensate for the initial outlay. In this connection, a recent letter written by the captain of a ship to his owners reads:—

> *Direction-Finder.*—This instrument has paid for itself this voyage. By its means I could steer, with perfect safety, round that dangerous Cape Sable, and in a perfect blizzard fetched up to the Pilot Station at Portland, Me. I got the pilot after a short wait, and got into port before six o'clock in the morning, while it was still dark; with daybreak, it came on the densest fog we have had this season, and it lasted till noon to-day.

METHOD OF NAVIGATION BY WIRELESS.

Navigation by wireless with the direction-finder aboard ship may be considered equivalent to, and in some respects as simple as, navigating by the aid of lighthouses, in clear weather, on a well-lit coast. All the ordinary methods of fixing the position of a ship can be used with wireless bearings, by which the bearing of one wireless station is transferred to the time at which a bearing of a second or third wireless station is obtained. A single wireless bearing can be used to fix the position of a ship on the Sumner line obtained from morning or afternoon sights.

It should, however, be remembered that quite a small error in angle may amount to a big error in position when dealing with a bearing of a wireless station many hundreds of miles away, and it is therefore advisable, when dealing with the more distant stations, to try to get bearings of at least three different ones and to select the probable position of the ship in the "cocked hat" or triangle of errors formed by the bearings. A wireless bearing, in the same way as a visual bearing, reaches the navigator on the arc of a great circle. A visual bearing is rarely taken of an object very far away, so this fact does not require special treatment. In the case of a wireless bearing, however, as the distance may be considerable, provision has to be made for this. The bearing can be plotted directly on a gnomonic chart, on which all great circles are straight lines, by the aid of either a station pointer or tracing paper. An objection to this is the fact that such a chart is a projection on which the navigator does not usually work, and the transferring of the resultant "fix" to the ordinary Mercator's chart is one more process in which an error may arise.

The correction of the great circle to the rhumb-line bearing can be carried out very easily by means of the conversion angle. The conversion angle is the difference between the great circle bearing and rhumb-line bearing at any point, and is determined by multiplying half the difference of longitude by the sine of the mid-latitude. The conversion angle to be applied can be easily obtained by inspection of a special diagram, and when this is applied to the observed bearing a "fix" can be plotted in the customary way on an ordinary Mercator chart.

The wireless direction-finder on board ship has a form of quadrantal error which can easily be determined, and plotted either in the form of a table or error curve. In any case, this is no very great difficulty to the navigator, who is used to correcting his course for variation and deviation; who applies a correction for the barometer reading to his patent sounding apparatus; corrects his barometer reading for latitude, temperature, and height above sea level; and realises that every instrument he uses requires the application of corrections for accurate work.

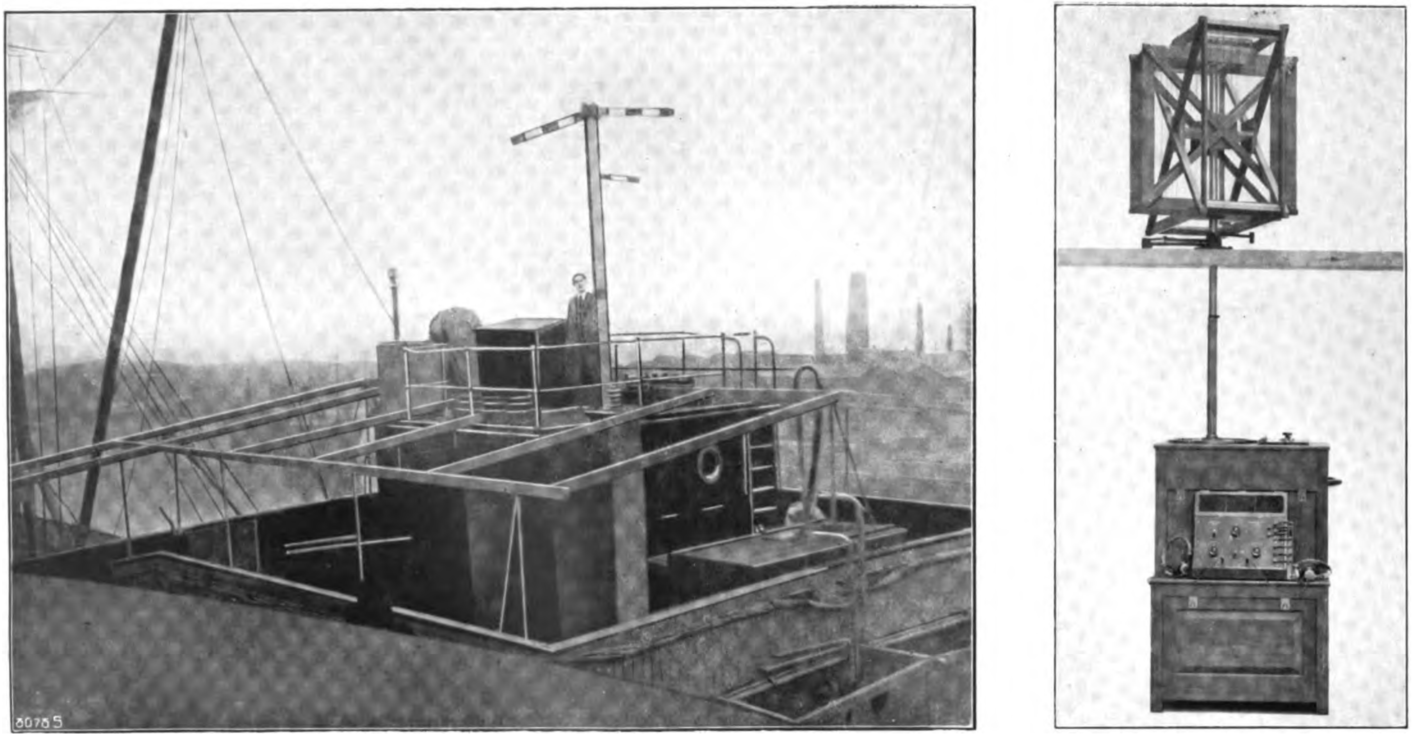
A direction-finder on a ship can be employed for taking a bearing of any other ship and, therefore, in thick weather a navigator can ascertain with considerable certainty whether there is any risk of collision. For example, should it be found that the bearing of an approaching ship does not alter when taken again after a short interval, then there is danger of collision. Should, however, the bearing of a ship alter by the stern she will pass astern of the vessel; should it alter by the bow she will cross ahead. During the taking of bearings upon other vessels in thick weather, the operator is very often able to determine a rough estimate of the rate of approach or nearness of the danger by noting changes in the intensity of the signals received.

All wireless bearings are, of course, relative to the ship's head, and must be converted to "true" by noting the compass reading at the moment of taking the bearing. This procedure is simplified in all cases where a gyro-compass equipment is installed aboard, since a repeater dial may be placed adjacent to the D.F. instruments.

Systems of Direction Finding.

There are two methods in general use at the present time:—(*a*) The crossed aerials and the radio-gonimeter, commonly known as the Bellini-Tosi method, employed by the Marconi Company, and (*b*) the rotating coil or frame aerial which is made use of in the Robinson method employed by the Radio Communication Company.

In the Bellini-Tosi method, the aerials usually consist of two large triangles which are set up to the jumper stay. These triangles are at right angles, one athwart ships, and one coincident with the fore-and-aft line of the ship. It is essential that these aerials should be exactly at right angles to one another, and that they should be set up sufficiently taut so as not to sag with wind pressure. Once the aerials have been installed, no alteration in adjacent rigging should be made as this is liable to affect the accuracy of the instrument. Furthermore, if possible, the aerial should not be unshipped for purposes of loading cargo, bunkering, etc. Screened wires from the fixed aerials are led to the radio-gonimeter in the wireless cabin. This instrument reproduces an exact replica of the electric fields which are traversing the fixed aerials above, and within this miniature field a small search coil is rotated. The effect is much the same as if a single-loop aerial or frame of large diameter were itself rotated, but has the advantage that the moving part is small. Bearings are obtained by what is known as the minimum method, the search coil being rotated until the signal disappears, the movement being continued until the signal is again heard, the mean of these two readings added to the true direction of the ship's head will give the true bearing.



WIRELESS DIRECTION-FINDING EQUIPMENT FOR SHIPS.

(The Radio Communication Co., Ltd.)

In the Robinson system no specially-rigged aerials are required; the aerials, comprising two small coils about 2 ft. 6 in. square, are fixed rigidly at right angles to one another on a wooden framework. These coils are usually contained in a watertight box fitted above the chart-room, or some similar position, and the receiving cabinet is installed in the chart room below, from which the entire instrument is operated. The coils are revolved by turning a wheel at the side of the receiving cabinet. The arrangement of the apparatus is illustrated on the Plate facing this page. In the Robinson method the bearing is determined not by the disappearance of the signal, but by comparing the strength of two signals when a switch is moved from one position to another. Among the good points of this method is the fact that a very definite reading of the pointer can be obtained (commonly called "sitting" readings) which greatly facilitates direction-finder work in rough weather, for a moment can be selected when the compass card of the ship is comparatively steady. Furthermore, the signal can be read whilst actually taking a bearing—an important point since it is obviously useless taking bearings on coastal stations or other ships unless they are at the same time identified. In the case of a brief S.O.S. signal this feature is of especial value. The fact that a signal is always audible during the process of taking a bearing is of great importance in order to obviate jamming from another wireless station.

BEST POSITION FOR INSTALLATION.

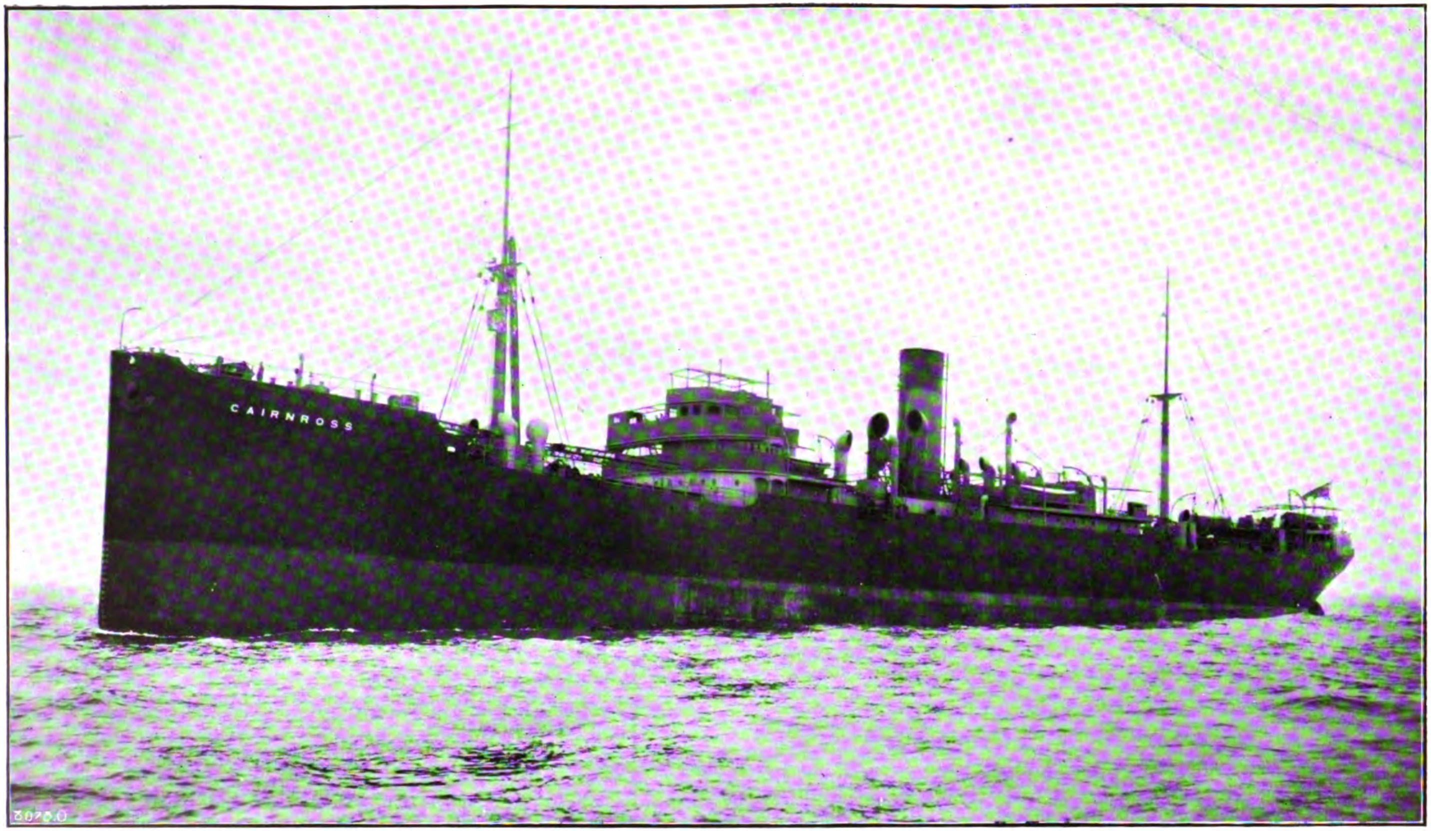
Some care is needed in the choice of the best position for fitting direction-finder installations, and the actual conditions aboard different vessels vary to such an extent that it is only possible to give general rules. The direction-finder aerials should be placed, if possible, on the fore-and-aft line of the ship and symmetrically disposed in relation to the rigging, funnels, or any large masses of metal; they should not be close to the lead-in of the ship's main aerial or to any of the ship's electrical circuits.

In the case of the Bellini-Tosi system, employed by the Marconi Company, the usual practice is to install the aerials as nearly as possible in the centre of the ship, usually between the funnels, and the directional instruments in the wireless cabin. In the Robinson system, employed by the Radio Communication Company, the small dimensions of the frame aerials enable the instrument to be installed either in the chart room or the wireless cabin, whichever is preferred; the former position is perhaps more appropriate to a navigational instrument since it comes under the direct observation of the ship's navigating officer.

Very frequently the most suitable position electrically is inconvenient, or the necessary space is required for other purposes, and a compromise has to be made between the most convenient position involving minimum structural alterations and the ideal position. It is to be hoped that, in the future, naval architects will give this matter their most careful attention, providing accommodation for the direction-finder with the same forethought as is given to the positioning of a standard compass.

Much criticism has from time to time been levelled against the direction-finder on the grounds that, owing to distortion effects which may occur in the wireless waves, errors in the instruments, etc., it cannot be relied upon. There are now, however, a sufficient number of ships fitted with direction finders to enable one to assert that sweeping statements of this nature are not justified. Recognising the fact that a particular bearing may occasionally prove to be unreliable, it should also be borne in mind that it is always possible by repeated observations and bearings on other stations continually to check the result. Any captain who would navigate his ship on the results obtained from a single or a few hastily taken wireless bearings without repeated check bearings and corroboration with other navigational aids, would not be worthy of his command. As improvements are introduced, however, and more information is collected relating to the stations from which reliable bearings can nearly always be obtained, the prejudice which frequently arises against any new appliance of this nature will gradually disappear.

B. BINYON.



(Photo: Frank & Sons, South Shields.)

S.S. CAIRNROSS, FOR MESSRS. CAIRNS, NOBLE & CO., LTD.

(Constructed by The Sunderland Shipbuilding Co., Ltd., Sunderland.)

CHAPTER VII.

THE WORK OF THE TRAMP STEAMER.

MANY shipowners resent their steamers being called "tramps." The name is not very old; but it expresses conveniently the difference between (*a*) a fast steamer which carries mails and passengers, and trades between fixed ports in accordance with a time-table, and (*b*) a steamer of moderate, if not slow, speed, which is available to go to the ends of the earth, provided sufficient inducement in the way of freight is offered.

The present purpose is to consider "tramp" steamers and their progress. It is almost like reading a fairy tale to review the changes and improvements during the last fifty years, when we recall that only sixty years ago the bulk of the carrying trade of the world was entirely in the hands of sailing-ship owners, and that at that time steam propulsion was the luxury of the few passenger liners. Yet so it was in the early 'sixties of last century. Except for a few speculative rash spirits, who built some small cargo steamers, chiefly for the coasting trade, there were hardly any "tramp" steamers; certainly none at all of 2,000 tons deadweight.

FROM SAIL TO STEAM.

The transition from sail to steam was slow at the commencement, and then became very rapid. The men who owned sailers, and whose fathers had sailed and owned sailers, could never believe that their wind jammers would ever be superseded; that coal would ever be procurable for bunkers all over the world; that steamers' engines would stand the strain of twenty days' continuous steaming without breaking down; and, above all, that the initial cost of an admittedly wasting asset could, or would, ever make sufficient profit to provide interest on capital and the inevitable depreciation. We know to-day that none of these difficulties besets a "tramp" owner—except the concluding one as to profits.

The shipbuilders rose to the occasion when it was seen that a formidable competitor to the sailing ship was arriving; and the engineers followed in their wake. The progression in type was rapid, each variation being an advance to render the machine more economical in handling, to make the vessel steam faster, and to enable her to carry a larger cargo on given dimensions. The early steamers were mostly built with 'tween decks, were long and narrow ships, and consequently of heavy draft; it was a case of building a sailing ship with engines. But experience very soon taught builders and owners that a different article altogether was necessary.

There were steam colliers in the early 'fifties and, while it is true that there were quite a few "tramp" steamships in the late 'sixties, it was the opening of the Suez Canal in 1869 which sounded the death knell of the sailing ship and paved the way for tramp-ship building and owning. It converted the East Coast sailing-ship builders to builders of "tramps," and it was within a year or two of 1914 that these East Coast builders topped the list in the tonnage production figures for the whole of the United Kingdom, the large majority of ships being "tramps." In saying this it should be recorded that the East Coast builders are now competing successfully in the production of the very highest class of passenger liners, which at one time were the monopoly of the Clyde and Belfast.

INCREASE OF TONNAGE.

It is not proposed to write a history of "tramp" ships. That has recently been done in the admirable book of Mr. Archibald Hurd, where he traces the history of shipowning back to the Persian Gulf in 6000 B.C. It is the writer's intention to discuss "tramp" ships only of modern times. The tonnage figures are most remarkable. Looking at them for the whole world as recorded by Lloyd's Register, we find there were in 1886, 10,291,000 gross tons of steam shipping. By 1900 it had more than doubled, and by 1914 it had more than doubled again, reaching the figure of 45,403,877 gross tons. The steamer tonnage in America, apart from the Great Lakes, in that year was 2,026,908, and during the war years, America built a huge commercial fleet of wood and steel ships, and to-day owns about 13½ millions of gross tons. A large number of these ships are laid up owing to lack of ability to compete in the world's markets under the restrictions of the existing American Navigation Laws. The impetus for this abnormal increase in building was, of course, the losses sustained by merchant shipping during the war; but, war or no war, there can be no doubt that, sooner or later, the great nation across the Atlantic would have made a definite bid for sea-power, refusing to allow foreigners to do all the carrying of passengers and goods, since she herself had formerly been a large shipowning nation and possesses on her own shores all the material and facilities for producing ships, if not the necessary numbers of officers and men to man them.

The war hit shipowning harder, perhaps, than any other industry. In 1917 and 1918, 2,479 British merchant vessels alone were lost through enemy action, amounting to nearly 8 million tons. The lives lost were over 14,000. In addition to this, over 1,800 vessels were damaged, but not sunk. The consequence of these depredations has been that a large number of shipowners have retired from business; their fleets having been destroyed, and, for various reasons, they have not resumed business. With such a huge loss of tonnage caused by the war, one might have expected the figures for the world to be much reduced from those of pre-war days. This was the case; but now, six years after the war, there is a greater tonnage than ever, ready to trade when politicians will settle their differences and allow the world to engage in commerce.

We can see, from the tonnage quoted, what an enormous business shipping is. We are only concerned with "tramp" ships here, and they constitute quite 60 per cent. of the total, the remainder being passenger ships and oil-tankers.

Just as the East Coast builders specialised in the building of "tramps," it followed naturally that the majority of "tramps" were owned in the East Coast ports. The sturdy long-headed Tynesider saw further than his brother on the Clyde, and, scrapping his sailers, adopted steam, years before the Scotsman began to foresee the end of the sailer. A very remarkable point to be observed is the variation in the tonnage registered at the various ports. While the East Coast led the way, it was only for a time; and at the beginning of 1900 the Clyde owners outstripped the East Coast, not only in numbers but in size and character of the type of ships. London has never been a large owner of "tramp" ships, but South Wales, during the last twenty years, has much increased its tonnage.

PROGRESS ABROAD.

Foreigners have been tardy in acquiring steamers—that is to say in the recent years with which we are now concerned. The Dutch and the Spaniards in the Renaissance period were, of course, much more important shipowners than the inhabitants of these Islands. The decline of any country is nowhere seen more clearly than in the decline of the mercantile fleet. In the period we are thinking of, viz: the "tramp" ship period, this country undoubtedly led the way. There were a few large liners sailing out of Northern German ports, and subsidised liners leaving French ports; but it may be doubted if thirty years ago either Germany or France owned any steamers which could come within the definition of "tramps." The French authorities gave great facilities to the owners of French steamers trading from French Colonies to France, and therefore the shipowner availed himself of his national advantages and did not require to tramp the oceans to find employment. Germany then had a large fleet of sailers and retained them longer than any other competitor. Hamburg owned the largest sailing ship ever produced, and went on building these huge sailers up to the beginning of the war. They traded chiefly with the West Coast in the nitrate trade. There were a few German ships which were purely "tramp" steamers, and many of what we should call cargo liners, *i.e.* steamers of the same character as British "tramps" but trading exclusively in accordance with a recognised trade programme. Scandinavia developed its "tramp" tonnage, whilst retaining, up to 1914, many sailers. The Norwegians and Danes have for the last twenty years been very keen competitors with British shipowners. The Italians must not be forgotten; but the next important competitors at the present time are undoubtedly the Greeks and Japanese.

The Greeks and Italians had always catered, both in steam and sail, for the Mediterranean and Levant trades from the Danube and Russia, which were theirs from very ancient times. But the War gave Greece, which was a neutral, an opportunity of making profits which her very keen commercial people quickly took advantage of.

Greece bought all the "tramp" ships which were saleable from 1914 to 1918, and now owns a considerable fleet. The same can be said of Japan, which, it is true, was a belligerent and not a neutral nation. Japan, however, had one advantage which was not open to Greece; she had shipbuilding yards and used them to their very utmost capacity. She produced in the war years an enormous fleet of ships, mostly large, and bought many British and Scandinavian boats also. The production in America and Japan accounts for the fact that there are more steamers and a larger tonnage in the world now in spite of the depredations of the German submarines during the War.

CHIEF "TRAMP" TRADES.

In the 'eighties and 'nineties, the chief trades of "tramps" were the Black Sea, Azov, and Danube. These countries were the largest wheat exporters of the world, and dealt largely also in other grain. The Eastern States and the St. Lawrence, with its very large lumber exports besides grain, gave employment to a very big fleet. At this period, the River Plate, Argentine, and Uruguay were only beginning to be exporters. Tonnage was attracted to these rivers from Europe by the very high freights paid for railway materials, etc., the return freights homewards being of quite a secondary character. To-day the order is reversed. Freight to the River Plate is not worth taking, and the exports of wheat and maize are among the largest in the world.

In the late 'eighties and 'nineties, the Indian Empire was rapidly increasing her exports, especially of wheat. The Far East has never offered a large field for "tramps"; tea, hemp, and such articles being carried chiefly by the liners. Java must not be omitted. The Northern Russian and Scandinavian ports gave employment to a large number of steamers, chiefly of small size, the cargoes consisting principally of wood. British owners participated in these trades, but Norwegians and Danes preserved the greater part of them for their own ships.

Up to the beginning of the war, "tramp" shipowning had been progressing moderately and surely, and ousting sailing ships from nearly all the trades which had been recognised as their particular preserves. The Pacific, North and South, and the Australian Colonies had practically changed their custom, and charters of sailers were few and far between. The opening of the Panama Canal, as far as the Pacific is concerned, has made the voyage to the North Western States just a usual one, and it is an ordinary occurrence for a steamer to be absent from her home port for six or nine months, just as it was the rule in the sailing ship days, the difference, however, being that the steamer will have visited many ports during the period, whereas the crew in the sailer were aboard for months without touching land. Steamers rarely steam continually for thirty days without calling at a port for coal or cargo.

RIVALRY OF THE "TRAMP" AND "LINER."

The change from sail to steam, the opening up of new countries like the Argentine, the development of new trades, gave romance to the shipowner's profession. We must not forget trades that have been large and notable factors in business, which are then lost owing to some new features. Time was when a large fleet of steamers was constantly employed carrying petroleum in tins or cases from Russia to India or China. This was a favourite trade with many owners, and afforded good outward freights to the East which have always been much needed. It was a large trade both from Russia and the Eastern States; but it only lasted some ten years. A very clever man conceived the idea of carrying petroleum in bulk in tanks, and the tank steamer was produced and the trade educated to receive their petroleum from the ocean tank steamer. Thus ended the Russian trade in tins and cases; but they are still exported from America in much reduced quantities.

"Tramp" steamship owning has suffered very seriously from the effects of the war; the principal reasons being: first, a tendency of the large liner companies to own "tramp" steamers as part of their business, and, secondly, a large restriction of trades. We are not seriously disturbed by the former. The conditions of "tramp" shipowning and liner shipowning are essentially different, and it is probable that the liner companies will find their "tramp" steamers an expensive luxury.

SPECIALISATION IN SHIPPING.

The fashion to-day is Centralisation, *i.e.* for an organisation to be self-contained and attempt to work half a dozen businesses under one direction. It is doubtful whether these methods will be successful, or lasting. In these days of competition, it is specialisation alone which can ultimately succeed, and it is doubtful whether the conflicting interests of shipowners and merchants can thrive for either or both under the same direction.

Restriction of trade is very serious indeed in its influence on shipping. The course of trading is always altering, and the would-be wise man is always trying to anticipate its movement. In the case of steam shipping, the owners have been consistently increasing the size of their ships. Thirty years ago a 4,000-tonner was a "large" ship. To-day 10,000-tonners are common. Time was when the shipping community had a very large *clientèle* of merchants, whose business it was to buy cargoes and charter a ship entirely for themselves, and to sell the whole cargo to a trader on this side. The war has so increased the value of commodities that the financial aspect assumes a different angle altogether from that of twenty years ago. The trades and the banks have met the situation, and what is known as the "Parcel" business has assumed dimensions never dreamt of twenty years ago. To-day steamers may have cargo shipped by twenty different shippers, which in turn is sold to twenty different buyers. It is easily seen that the finance for the twenty different operations is a very easy matter in comparison with buying, financing and selling a whole cargo in one operation. It is this which is helping the liner companies so much. Their ships sail from a fixed point to a fixed point at a fixed Conference rate, and they will book

100 or 2,000 tons as a merchant may require. It is too soon after the war to dogmatise as to the ultimate result of these changes.

THE IMPROVEMENT OF THE "TRAMP" SHIP.

The "tramp" owner of to-day is working with very superior machines as compared with those which his father manipulated twenty-five years ago. All steamers now have electric light. Officers and engineers are berthed in separate rooms. Steamers are more speedy, 10-knot boats being common as against 7 or 8 knots. In discussing the question to-day we may say the period is one of transition. We see the liner companies owning "tramps," and the "tramp" owners giving up business or standing by. We see the former chief "tramp" trade, Southern and Northern Russia, out of business. The United States of America is trying to become a shipowner nation. We hear of their 1,400 steamers laid up which cost £30 to £40 per ton to produce, and which would be unsaleable at £4 per ton. We may well pause to consider what the future has in store, when Europe is once again at peace and is able to buy goods to make good the wastage of the last ten years, and then to grow crops and export—and therefore to trade.

It may be a matter of wonder how any one can sink capital in ships when the trade is exposed to so many uncertainties, and when there are so many vicissitudes connected with such a business. Famines, locusts, droughts, strikes, plethora of crops, are alike the friends of shipowners. A famine in India or Russia stimulates the demand for wheat from the Argentine or America. Locusts eat up the crops in the Plate, and the small harvest there has to be replaced from the abundance, say, in Russia. A dry summer in France ruins the crops, and abnormal importation becomes necessary. It is from these and similar causes that "tramp" steamers reap their reward for initiative and enterprise. Abundant crops North, East, South, and West, always result in very low prices and absence of demand. These are the times when there is only a small movement of produce and the carriers have to put up with bad trade. The ideal conditions for the shipowner are when crops are abundant in the distant countries, such as Australia and the Pacific, and the crops in Europe are short. Then it is that steamers have a long haul, that the demand for tonnage is keen, and the supply of tonnage meagre.

Shipowning is a speculative business. Experience shows that trade runs in cycles; that two years of good trade are often followed by five years of depression, and that, on an average, the return which the capitalists obtain from shipping compares unfavourably with that which the same capitalists might have got from an investment in Consols. But the lure of high interest now and again has always been, and ever will be, an attraction, and the years of the inevitable low interest, or none at all, are not remembered by those who have experienced good and bad years. They are certainly unknown to the neophytes who step in "where angels fear to tread" and succumb to the temptation to get rich quickly by the tempting offers made to them to become shipowners with borrowed money.

J. HOWARD GLOVER.

CHAPTER VIII.

SEA-TRAINING OF MERCHANT SEAMEN.

SHOULD the present system of training the British Merchant Seamen be revised? If so, what is the reason for revision, and what constructive proposals can be submitted? Any system which does not adapt itself to the changes due to time, obviously requires amendment, and to restore impaired efficiency, the elements of inherent alteration due to material and the relative changes due to foreign competition must bear on the solution. These decide not only the fundamental principle, but also the standard to be attained. The writer would only remark, before reviewing the general situation, that the sailing-ship era was responsible for the sea-training of the vast majority of the recent war-time senior officers and men, and it is desirable—indeed imperative—to perpetuate an equally high standard in the future.

The present system of sea-training is a common one to both seaman and officer. Any deck hand (*i.e.* boy, ordinary seaman, sailor, or A.B.) after four years afloat is as eligible to sit for an officer's certificate as any indentured apprentice. There is no physical examination other than for eyesight, and only a practically negligible general education is needed. The technical papers and *vivâ voce* examination require two or three months at a navigation school if the candidate has not had previous instruction.

LOWERING OF THE STANDARD.

This easy method of qualification—practically mere servitude—for an officer's *status* results in the provision of hundreds of officers in excess of requirements, and consequently many of necessity withdraw to take up shore work, conducing thereby to a gradual elimination of the Public School (or apprentice) type, as distinct from Council School (or foc'sle) type, and a progressive descent to the lowest standard of *physique* and education that the nation produces. There is now no safeguard such as resulted from the sailing-ship training test, which automatically rejected the unfit and gave the youngster all those qualities which are even more necessary now than formerly when ships were slower and smaller, and when the number of lives dependent on individual action or judgment was comparatively few. Most liner companies select their officers from apprentices trained in their own ships, and have their own physical examination. For instance, the P. & O. and Canadian Pacific Steamship Companies enter their future officers as cadets in either the

Worcester, Conway, or the Pangbourne Nautical Schools for two years, prior to receiving them in their own fleet to complete the qualifying time for an officer's certificate. The New Zealand Steamship Co., Brocklebanks, Alfred Holt, Leyland, British India Steam Navigation, the Royal Mail Steam Packet Co., and others, carry a large number of apprentices on certain of their ships, provide supervision and instruction, and separate living quarters apart from the men in every respect—matters which, in ships carrying but two apprentices only, are too frequently neglected. Except in a minority of ships, therefore, there is no likelihood that the training will in any degree be above that which the legal scale permits, and thus the question is briefly, whether the existing low legal standard in both physique and education is not tending not only to the prejudice of the profession, but also to the growth of a national danger.

We cannot ignore the fact that our principal competitors, Sweden, Germany, Holland, Denmark, and Japan, have, for the officers of their respective mercantile marines, a physical and educational examination superior to that of Great Britain and comparable to that of the disciplined Services. That being so, it may be contended with force that our own State legislation, such as now obtains, should be brought up to competitive requirements for the sake of an assured efficiency, having particular regard to the greater relative importance of an efficient Merchant Service to an Island Empire both in peace and war.

BRITAIN'S GREATEST ASSET.

It is a fact of universal agreement, that Britain's shipping industry is her greatest asset. It is the all-important foundation whereon is based and built our economic and military strength, and it alone ensures to our commerce a world pre-eminent influence. The British shipping industry is so vast, and possesses such illimitable ramifications throughout the Kingdom and Empire, that it may be said to be a national institution under economic, private, and therefore efficient, management. No one, with the examples of the Australian, United States, and Canadian nationalised shipping ventures before their eyes, would surely desire to substitute State management; that is, to change a source of income into a source of expense—for that is what it is in each of those cases, and must inevitably be in ours if we should adopt it.

Whatever other nations may do in order to promote their shipping industry, whether by subsidy, reservation of their own coastwise and inter-colonial traffic to their own nationals, or by direct State ownership, that sort of thing Great Britain cannot do, by reason of the magnitude of the problem and the self-governing control of the major sections of the Empire. Alone among our competitors, we must stand or fall according to our competitive merits of ship-manning afloat and ship-management ashore. An industry, plainly, cannot hold the premier position if dependent on a subsidy maintained at the expense of the trades it serves.

It is a truism that the wealth of Britain depends on her sales abroad, which pay for her imported food and raw materials; with an increasing population and liabilities, the only medium for the transaction of this business of provision becomes a most vital consideration. There is no question here of supersession by aerial substitutes, whatever may be claimed with regard to the military services. Except in special trades, such as the oil trade, where the companies own, and may be said to subsidize their tanker fleets, all other fleets of ships survive solely by underbidding their competitors. Where the trades concerned find it otherwise and are called upon to contribute to their running expenses, such fleets cease to ply—as is seen in the case of ships of the American Shipping Board.

For these reasons, the utmost caution is requisite in urging any suggestion as to sea-training or anything else that would entail increased working expenditure.

With the recent war's experience as a guide to our measure both of safety and of danger by reason of this being an Island Kingdom, the realisation of the paramount necessity of possessing both a vast number of ships and a corresponding supply of competent ship-complements cannot fail to be realised by every thinking person. Unremunerative merchant ships are too expensive for the wealthiest of nations. Only the fittest can survive and extend an island State's credit and influence.

THE SAILING-SHIP ERA.

An adequate system of recruitment and training to fulfil the requirements predicates sound constitutional health, early and prolonged sea-going experience under supervision, together with suitable technical instruction, the whole being designed to establish skill in navigation and leadership. This, of course, is no original suggestion. The majority of the recent wartime shipmasters were, without prearranged design, the product of such a school. In sailing ships, masts and yards levied their toll of the nervous and physically unfit. Many of those who completed their apprenticeship (about 60 per cent.) were further eliminated as junior officers when, in the course of their routine work, they personally commanded the men in yard and sail-trimming, or led them aloft to reef or furl. Instinctively, the qualities of leadership were acquired, and aptitude in maintaining discipline resulted. Neither officers nor men were unaccustomed to the voice of command; it was the logical sequence of the situation. Failing the ready and appropriate order, all became chaos; sails, yards, masts, boats, or men were carried away or lost, terminating at least one career, if not more!

The school of sailing ships is now, however, a closed institution, yet the increased size and speed of vessels and the number of lives on board, together with the more crowded trade-routes and the continuous competition of foreigners, immensely enhance the responsibilities of the officer. He needs not less thorough preparation, but rather more thorough preparation if he is to be fitted to meet those occasions when his orders and actions determine the course that the ship or the crew must pursue. No mechanical device can eliminate the personal equation. The value of safety appliances is largely discounted by their compelling the acceptance of added risks. The propeller only produces the effect of a constant fair wind driving the ship on through head seas and fog. The direction finder gives less reason for delay in thick weather; and in fact, every such factor, although affording most valuable assistance as regards one particular risk, nevertheless intensifies all other risks not similarly covered. Our forefathers could not, for instance, command a ship carrying 5,000 lives, or in a flat calm drive into a derelict or a ledge of ice at express speed. They had not the means to do so.

THE *RÉGIME* OF THE STEAM FLEET.

The men nowadays no longer work under the immediate supervision of the officer of the watch, and, maybe, they are unknown to each other even by sight Except at occasional evolutions of fire or boat stations, the normal routine entails no "team work," and until an emergency arises, supernatural powers alone can decide if a crew is highly efficient or hopelessly incompetent as a disciplined whole. The Board of Trade certify men as "seamen" without any technical or physical examination. This, in itself, would be of less importance if the officers themselves were better trained and selected, and the masters given increased disciplinary authority. But that is not the case.

Leadership, which is an innate characteristic and exclusive to no particular class or race, is the spirit of executive command. It is this inspiration which determines the direction and psychological moment of professional action. It accepts an unlimited responsibility, and is fearful only of its own hesitation. It is, when functioning within its own sphere, the antithesis of the democratic principle. It is anathema to the bureaucratic mind, and can never be evolved under its *ægis.*

The continuity of Empire status is fundamentally dependent on military efficiency, which the increasing civilian interference emasculates as surely as does State interference in commercial enterprise. Is initiative, executive and leadership ability encouraged or stifled by our present day methods?

DEMOCRACY AND DISCIPLINE.

Democratic administration denotes collective government, hence responsibility is divided, and any resultant breakdown, miscarriage, or confusion, is met, not by detection and penalties, but by the indemnification of the inefficient responsible official. The personal equation is submerged if not altogether lost. There is no independent entity to deal with. No voice, except the official voice coming from a position of security from personal responsibility, can speak with decision. Criticism, however logical and obvious of itself, is accorded scant consideration unless attention to it is compelled by a recognised professional body, whose most potent weapon and convincing argument is its own impersonal advocacy.

To a military as much as to a civilian body, a corps and collective representation is therefore essential. Without such a rallying centre of expression of opinion in accordance with the corps conscience, rank, uniform, and any other coveted distinction of senior office, will be claimed and seized by ambitious rivals, as being no longer exclusively deserved. Hence corps distinctions are diminished in value; they become adulterated and lose the stimulating quality of special recognition. Lacking recognition, confidence is impaired and discipline and leadership become perfunctory and nominal.

To the professional mind, any scheme of sea-training that ignores in its curriculum a recognition of this sentiment evades its major responsibilities.

INSURANCE FOR WAR.

The mercantile marine may not be—in fact is not—a military service, yet in the period 1914–1918, 12,685 of its officers were enrolled for service under the White Ensign. All merchant ships were eventually armed, while over 9 millions of gross tonnage were destroyed by enemy action.

A higher percentage of the sea-going *personnel* was lost than probably was the case with any other profession, calling, or trade. At the end of the war there were some 3,500 naval auxiliary vessels which had been converted from fishing and trading purposes. There were enrolled in the Royal Navy three men drawn from volunteers or the mercantile marine to one man on the regular establishment of the Navy at the outbreak of the war. The Navy, too, since 1918, is diminishing; the mercantile marine, on the other hand, is expanding. Only if it is assumed that conditions akin to the above cannot possibly recur, can a recognition of the necessity of a military objective in the training of our seamen be denied.

Military success is impossible without competent leadership—be it of *personnel* or in the use of material. Mechanical devices are increasingly replacing the human element, but executive intelligence must remain a human quantity. The humble sphere of shipmaster cannot afford to exclude this element in its composition. A lower degree of sea-efficiency in the war on our part, might well have resulted in a foreign army being in occupation of this country as our uninvited guests, and the next emergency may be even less a calculable quandary. Sea training which does not envisage the requirements of war really neglects insurance against definitely known national liability.

THE ROYAL NAVAL RESERVE.

Why should not every master of a foreign-going ship be *ipso facto* an officer R.N.R., provided he also attains some minimum Admiralty qualification? It goes without saying that his ship will be armed in war time, and, in consequence, his nerve and resource in its handling and use will be pitted, possibly in single combat, against some foreign antagonist. For this purpose, the master need not be re-examined on points already covered by the Board of Trade Certificate, but additional tests should be introduced to suit Admiralty requirements. For instance:—

1. Twenty-four months' actual sea service in command outside home trade limits, within any three consecutive years.
2. Extra-Master's Board of Trade Certificate.
3. Knowledge of the use of a defensive armament and of convoy organisation and signals.

Lieut.-Commander's and Commander's rank, respectively, in cargo and passenger ships might be granted, entitling the master to wear the appropriate uniform during his period of command, but not otherwise. Marine-Superintendents who have previously qualified in this way to be *ipso facto* Captains R.N.R., which rank also should be granted to selected officers afloat.

This suggestion is submitted because the officers the Admiralty (or Ministry of Shipping) would accept for service, are those—and rightly so—already available as certified by the Board of Trade and selected by the shipping companies. These same men are those who would normally receive (in peace or war) official instructions relating to any trooping, transport, or convoy service required to be carried out.

The State Services and the different sections of the much subdivided Merchant Service would herein find a *liaison* and a common atmosphere wherein to co-operate in whatever national emergency demanded their united efforts.

The late war found the Navy and Army dependent on the Merchant Service for every movement to an extent not anticipated. The quarterly returns of merchant ships destroyed by enemy action by April 1917, it is common knowledge, alone justified the greatest apprehension as to the practicability of continuing our maritime effort. Merchant ships were indifferently equipped or provided, in regard to every reasonable requirement as to armament, as well as in the matter of direction and relevant intelligence. What the naval authorities expected of the masters, the masters did not know and had no means of knowing; what is more, they do not know it now if a similar situation were to arise again. What the masters called for was not comprehended by the authority to whom they were responsible.

It will be recalled that the average loss of merchant ships in the second quarter of 1917 was 10·43 *per diem.* Great Britain alone lost 1,361,870 gross tons during this period. It is probably a moderate estimate that 80 per cent. of these ships were not carrying out the precautions recommended by the Admiralty, who, without exception, had enforced them since early in the war, in 1914, in every requisitioned ship for service under the White Ensign. These precautions—easily realisable by merchant ships—were, principally, to steer a zig-zag course in daylight, and to obscure every glimmer of light during dark hours, switching on navigation lights only if necessary to avoid collisions.

Why did the Board of Trade not order this to be put into practice and thus give the ships an opportunity of making half their voyages at least in the protection of complete invisibility, instead of, by exhibiting their regulation navigation lights, facilitating the task of the submarine and raider?

The masters, with no superior authority to indemnify them against a breach of the Board of Trade Rules and Regulations, etc., had but a choice of the deep sea and devil.

More than once did masters individually and through the Mercantile Marine Service Association apply for definite orders so that they should know how to act and—almost of equal importance—how they might expect other ships to be acting.

This point is reluctantly raised because the writer knows of no improvement in organisation at headquarters that indicates clearer perception of our professional needs. Up-to-date representation is the solution wherever and whenever the shipmaster's co-operation is essential. The co-operation essential is obviously a continuing one—beyond the limits of ports, outside the range of the guns of a protecting escort, and independent of confusing W/T codes. The best of ships and of crews are nothing more than moored targets if they have only an uninstructed intelligence to command them, and it is these last who have to be recognised as an inseparable component in a national scheme of defence, as much so as the Navy, Army or Air Force.

THE "BAD HATS" OF THE SERVICE.

The worst evils the men endure arise from among their midst. It is not difficult to imagine the relief it would be to other members of a ship's forecastle—where from ten to fifty men of varying ages may be in one common living compartment—if the one or two habitually drunken or criminal or chronically diseased members of their number—always to be found in every collection of men—could be drastically dealt with; not only dismissed the ship, but also dismissed the service. The present-day absence of strenuous exertion, such as in former days mast and yards' work entailed, encourages the least desirable element of the population to take refuge in a seaman's job. The superior type of man, of which there is a plentiful supply available, would more readily take to a sea career and the respectable youngsters on the many training ships would not so readily throw up the foc'sle life, were some measure of protection afforded them from companionship with the rowdyism that exists to-day. The contrast to the cleanliness and discipline of the training ship that youngsters encounter afloat can be easily imagined, and the result is that, for about 20 per cent. of the young recruits, their first voyage is also their last.

Yet the Board of Trade acknowledges absolutely no undesirable element as existing among the men. An officer may be dismissed the Service for misconduct, but it is not so in the case of a foc'sle rating. One man may make a ship's foc'sle a veritable hell, and yet the master is powerless to take suitable action. This statement roughly summarises the general situation afloat at the present time. The writer speaks within the limits of his thirty-four years' sea-going experience both in sailing and in steam-ships, and pretends to no knowledge superior to that of any other seaman of equivalent service.

A SHIPMASTERS' SOCIETY.

It is to be hoped, furthermore, that a Shipmasters' Society may soon be established so that there may be—as in other professions—an authoritative body of opinion representing on purely technical points the collective voice of the most experienced members of the profession. Lacking such a technical society, many nautical problems are neglected, or, worse still, are liable to be settled by negotiation with self-styled representatives of the shipmasters; persons too often devoid of credit or merit within the circle from which they profess to receive recognition and to represent.

The 1920 International Seafarers' Conference at Genoa, where civilian delegates claimed that officers desired the three deck-watch system for the men, is an instance not only of the extent of the misrepresentation of the shipmasters' views, but also exhibits the danger of there being no representative organisation by means of which the shipmasters' opinion can be obtained. As is well known, France last year reverted to the double-watch system after experimenting with this impracticable innovation of three watches. That occurred after a strike sufficiently costly. Had that strike occurred in the United Kingdom it might well have added a shilling or so to our income tax. Individuals who, for political or other ulterior motives, seek to initiate a practice so economically unsound are no fit representatives of those whose interests they profess to serve. The question of the Standard Uniform is another recent instance. If indeed it is worthy of all that its sponsors claim on its behalf, why is it out of favour with the officers in nearly all the large companies? The conservatism of the true-bred seaman is beyond the comprehension of the political agitator, and that is probably the reason why existing officers' societies and the direct-actionist policy advocated in their post-war literature, enlist so few adherents. Will this attitude of the officers, however, be continued? With the prevailing system of elimination of the Public School element in favour of the Council School type of entrant, probably it will not. At present we have the paradoxical position of the interests of thousands of responsible men being manipulated by a small unelected faction whose aims and methods have nothing in common with the temperaments and ideas of the large majority they claim to represent. Parents naturally will hesitate to pay some £300 for a two-years' training in one of the Nautical Cadet Training Schools, followed by a premium for apprenticeship, if their son's career is eventually to be cast among persons they consider, for whatever reason, undesirable associates. This is the present-day direction towards which things are progressing. It is the inevitable outcome to an indiscriminate influx. Surely no apology is needed for an attempt to reclaim the Service as a livelihood for men educated and physically fit; unless, of course, it can be shown that we are nationally bankrupt of the necessary stock wherewith to maintain the requisite numbers.

THE CALL OF THE SEA.

The *queue* of applicants for any vacancy is sufficient evidence to negative this latter hypothesis, although it is relevant to observe that within modern times this predicament has been the experience of several countries. The merchant fleets of the United States, Japan, Chile, and Peru, which, for varying periods, had to make shift by the admission of foreigners, have suffered from the want of a trained *personnel.* What, however, is merely a transient economic phenomenon in one country may prove a vital national danger in another.

The Worcester, Conway, and The Nautical College at Pangbourne, which now only provide eight per cent. of the apprentices, are capable of indefinite expansion and could train any desired number of officers, whose subsequent three years in sea-going cadet-ships (such as already exist) would ensure us an executive second-to-none in the world. In addition, scholarships should be granted for Council School competition. Japan, Germany, Sweden, Denmark, and Holland have systems on such lines.

For a number of years, no doubt, the output may not satisfy the demand, but if the principal companies would engage to recruit only from the officer establishments, the more desirable portion of educated and physically fit young officers would be saved to the profession and would also encourage others of the same good class to enter. Rejections of junior officers on account of physical disability during a period of sixteen years have averaged 14·2 per cent. in a leading London shipping company, showing a marked increase in post-war examinations. It is safe to assume that these rejected applicants will apply elsewhere until accepted in those companies—the majority—which have no such examination in force.

This serves to emphasise the necessity for a Board of Trade medical examination of future apprentice-applicants, not only to protect the ship, passengers, and crew against those who are physically incompetent, but to prevent the great hardship accruing to those who, after many years of preparatory training, find themselves debarred from reaping the fruit thereof. If it should be considered worth while to initiate any such radical course retrospectively, compensation is obviously due to those affected.

It should be noted also that the above rejections were not made under so strict a standard as for the Military Services, but under such headings as: Phthisis; complete or partial lack of vision of one eye; deafness—in fact, mostly constitutional defects or disorders.

PROSPECTS IN THE MERCHANT SERVICE.

The pay (£1,800 to £250) and living conditions (from palatial flat to one-roomed tenement) are too radically distinct in different companies for one to be able to epitomise the "prospect" of a lad going to sea with a view of rising eventually to command. For convenience of book-keeping purposes, the Board of Trade, and also the trades unions, have relegated the sea *personnel* into certain categories (*e.g.* the Standard Uniform), but the size of ships and the respective responsibilities of those who officer them (50,000 tons mail steamer and thousands of lives to the diminutive cargo-carrier), as well as the difference in seniority in regard to appointments, are all so divergent that regulations, and also discipline, require overhauling and amendment to make them adaptable to actual conditions. As regards discipline, the Marine Superintendent of the White Star Line (Commodore C. A. Bartlett, C.B., R.N.R.), speaking on this subject in Liverpool, said, as reported in *Lloyd's List* of February 19, 1923:—

> When they looked around the harbours and docks and saw fine steamers of all types and sizes, they were often amazed with the splendid condition they were in, and would no doubt note what excellent organisation obtained on board for the running of the ships. In maintaining that efficiency, they had to thank the many masters, officers, and crews for pulling so well together under existing circumstances, and it was only done by that spirit of conscientiousness born in every British seaman. But the best of seamen required discipline, and really welcomed it, and no ship was happy without it. Unless the penalties for breaking away from good order were adequate, and the means of enforcing the same satisfactory, a shipmaster was seriously handicapped not only in efficiency, in routine, and work, but the safety of the ship was jeopardised.
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> The Merchant Shipping Act, 1894 (and subsequent editions up to date), was, in his opinion, entirely a one-sided agreement, principally in favour of the crews, and gave the shipmaster little or no authority to maintain discipline. In fact, it appeared to him that the master was solely responsible for every little detail that had to be attended to, and, for any omissions, heavy penalties could be charged up against him. Consequently, bound up with red tape difficulties, he had, as often as not, allowed the offender to go free rather than take any chances.

THE MAINTENANCE OF DISCIPLINE.

Commodore Bartlett went on to furnish a series of provisions sanctioned by the Board of Trade in pursuance of the Merchant Shipping Act, and placed on all articles of agreement covering the undermentioned offences:—

(1) Striking or assaulting any person on board or belonging to the ship (if not otherwise prosecuted), a fine of 5*s*.

(2) Bringing or having on board intoxicating liquors, 5*s*.

(3) Drunkenness, first offence, 5*s*.; drunkenness, second and each subsequent offence, 10*s*.

(4) Taking on board and keeping possession of any firearms, knuckle-duster, loaded cane, slung shot, swordstick, bowie knife, dagger, or any other offensive weapon or offensive instrument without the concurrence of the master, for every day during which a seaman retains such weapon or instrument, 5*s*.

(5) Insolent or contemptuous language or behaviour to the master or officers, or disobedience to lawful commands (if not otherwise dealt with according to law), 5*s*.

(6) Absence without leave (if not otherwise dealt with according to law) for each day on which such absence occurs, 5*s*.

Those provisions, he went on, were practically all there was to enable discipline to be maintained. In his opinion they were ridiculously inadequate, especially now that the rates of pay of seamen were over 200 per cent. more than at the time the Act was passed.

> Fines for most serious offences were only 5*s*., except in case of repeated drunkenness, when 10*s*. was allowed. Hence, any member of the crew could even assault a master or other superior officer for the payment of 5*s*.; and instances had been known where the men had boasted and bragged that it was worth while paying that sum for the satisfaction of showing their mutinous spirit.

All these penalties should be increased substantially, and imprisonment, without the option of a fine, given in certain cases. He would point out that fines were all paid into the Board of Trade, although the men might have caused not only annoyance and delay, but expense, to the master or owner. Even in port, the police would not interfere unless there was serious wounding or killing. Therefore, the master and officers often had to face many insulting and degrading positions in dealing with bad characters, and, strange to say, in the majority of cases brought before consuls and magistrates, those gentlemen mostly favoured the so-called "poor sailors," and dealt most leniently with them, although perhaps the trouble that occurred had actually put the safety of the ship in jeopardy.

What he would recommend was that the Board of Trade should issue a strong caution to the men by placing a special clause on the articles covering discipline, that more help should be obtained from the civil police at all ports, and that they should have increased fines and more backing for the master when inflicting fines at the pay-off. When cases were brought to the Court, the Board of Trade solicitors should attend and help the prosecution, whether in the interest of master or man. In fact, he would suggest that a Merchant Service Discipline Act be brought into being. He had received a number of letters from different masters on that subject; in all cases they spoke of the inadequacy of the punishments at present in force for offences committed on board a British ship, and advocated that something should be done to help them in that matter.

There have been many cases of men joining their ship in dock, and, because she had not immediately sailed, walking ashore, ignoring the work required of them in preparing for sea, even being absent when necessary boat drills and muster stations had to be carried out, only coming on board just prior to sailing, and then often the worse for liquor. As the ship could not be delayed to prosecute the men (as to do that it was necessary to hold back the master, or other officers, of the ship to prosecute) the offender got off with the slight penalty he (Commodore Bartlett) had mentioned. The Seamen's Union had given every assistance in making conditions better in that respect, but there was much more to be done. He would suggest that the Board of Trade give that question their earnest attention on the lines of the recommendations he had specified. Not only would it be more satisfactory to the master, but the good and steady man himself would be greatly benefited if more stringent laws were made to stamp out, or reform, the wasters, as they were a menace to the efficiency, happiness, and even the safety of the ship.

It may be added that in a discussion on Commodore Bartlett's remarks, the speakers, all of them captains of long and wide experience in the mercantile marine, or the Navy, endorsed his views.

SUGGESTIONS FOR REFORM.

Improvement can be effected only by a system resting on adequate powers to enforce discipline and providing suitable officers to exercise it. With due authority and protection by an improved discipline, the already existing sources of supply could man the ships with greater efficiency and to a greater extent than they do now. As is well known, the senior officers of the three branches (Deck, Engine, and Catering) select their own staffs; and no better proceeding can be desired.

The following points require attention. A "character" that would be rejected by a man-of-war or a regiment should, for precisely the same reason, be debarred from entering a merchant ship's forecastle—by law. The master, with a crew possibly exceeding the complement of a warship or a regiment, should not be compelled to take every defaulter to the local police-court any more than the Naval Captain of a warship or the Colonel of a regiment should; and for the reason that it is, in 90 per cent. of cases, practically impossible to do so—particularly abroad. The fact also that merchant ships carry no guard, no marines, no ships' police, is a further argument in favour of summary powers.

On account of the confined living conditions, it is the men themselves who would benefit most by gaining definite relief from the curse of riotous conduct on the part of one or more of their number, which is the main obstacle to the best type of man continuing a sea-career. To attempt to encourage and train a superior recruitment which will endure, without dealing with the cause of the abrupt termination of so many careers, is worse than wasted effort. No one is justified in recommending the life, unless protection of the person afloat comparable with that on shore is secured.

THE SUPPLY OF OFFICERS AND SEAMEN.

There is no likelihood of any insufficiency of suitable officers—provided the present system is not continued to the point when such influx of one class occurs that parents conclude that the Merchant Service is a profession to be taken up only as a last resource. As regards the men and the economic requirements of an assured supply, owing to the fact that little education is essential, that the requisite technical knowledge is easily acquired, and that all duties can be competently performed by those in normal good health, recruitment should be unrestricted.

Much harm results from the poetic licence with which nautical writers picture the sailor's life—the youthful imagination is stirred, and the foc'sle receives one more chronic malcontent! Nevertheless, with all its limitations, the sailor's life is preferable in regard to wages, food, and lightness of manual labour, to many a calling on land. The foc'sle life, however, must be frankly recognised as unsuitable for those of ambitious temperament.

An examination for wheel, lead, boat, and look-out duties before a rating of A.B. is granted, should be regarded as a *sine quâ non.* The present rate of pay, board and lodging and £2 per week, is not an unattractive prospect for the comparatively unskilled and uneducated labour required to fill the position of A.B.

Thus, without State interference (more than now obtains) or expense to the employer, or any likelihood of reducing the available supply of *personnel,* the following amendments to existing legislation which, it is suggested, would find endorsement not only by shipmasters and pilots, but also by many shipping companies, are submitted. They go to the root of the matter and would benefit all concerned:—

(1) Physical examination of future officer-applicants.

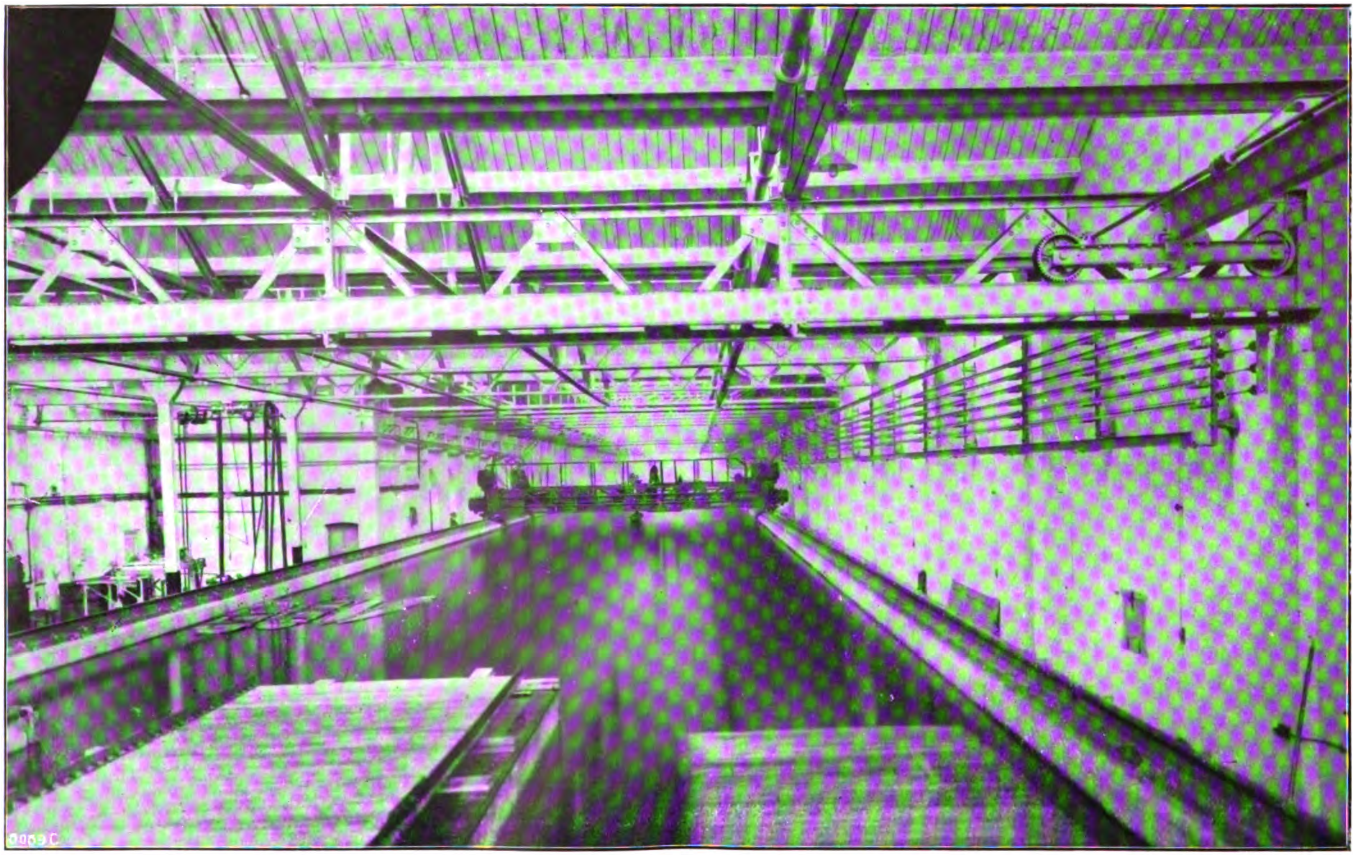
(2) Apprentices to be carried only in certified ships.

(3) Medical examination of men to ensure the absence of communicable disease such as consumption, venereal diseases, etc.

(4) Dismissal of any member of the crew from the Service for those offences for which he could be dismissed (and for which he may have already been dismissed) from other disciplined Services.

(5) Technical examination by a qualified officer of men before rating them A.B.

SELWYN M. DAY.



EXPERIMENT TANK AT THE NATIONAL PHYSICAL LABORATORY.

CHAPTER IX.

THE SHIPOWNER, AND RESEARCH IN PROPULSION.

> By science we learn to doubt, to recast values, to change.
> *F. W. Sanderson.*

FOR the last few years, the great problem of the shipowner has been so to reduce his expenses as to bring these within the limits of his financial returns and so earn a profit. In this endeavour he has tried many things—new engines, new types of construction, new dock facilities for loading and unloading. Occasionally he has used an experiment tank to guide him in ordering a vessel, or working his ship. This chapter deals solely with this last-named method, and shows the variety of ways in which a shipowner can use a tank to his own benefit, and the need for support of this form of activity.

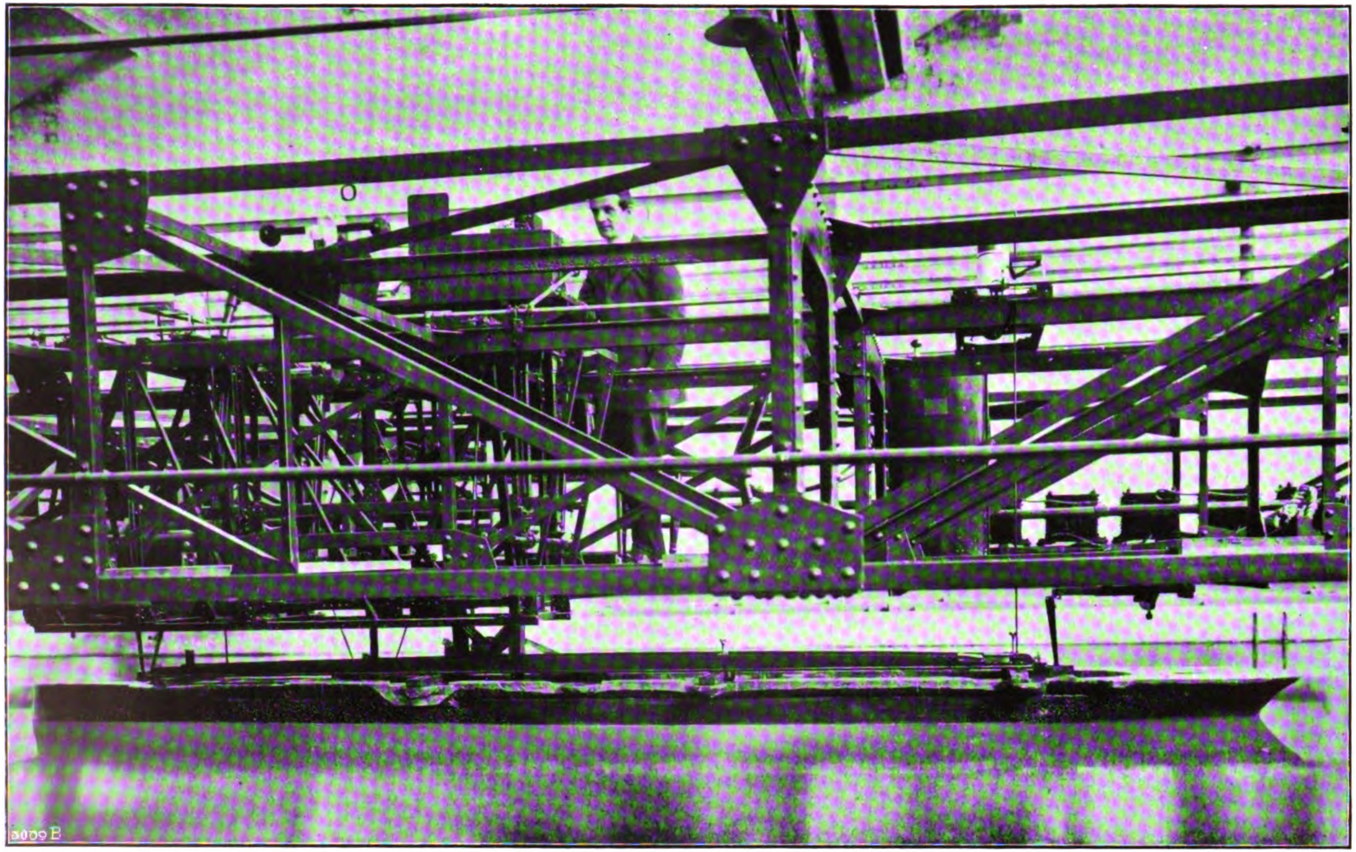
Although much might be said of the national aspect of the work of an experiment tank, only two points which have obvious and direct effects upon English shipowners need be mentioned. First, since the national tank was opened nearly thirteen years ago, four other important countries have built and equipped tanks for purely mercantile research work, and the American naval tank at Washington is now devoting quite a fair percentage of its time to mercantile problems. Secondly, the amount of research work carried out in Germany and Austria alone, both on models and ships, is many times greater than that which has been carried out in this country. The moral to both these points is to be found in a recent statement of Sir Frank Heath's: "There will be severe competition between the nations of the world, and success will go in one direction or another on a very narrow margin. . . . It is on narrow margins that scientific investigations give results." The great factor in maintaining that narrow margin is the elimination of the propulsively inefficient. It was the realisation of these important truths, and the desire that the British mercantile marine should maintain its supremacy, which led the late Sir William White to advocate the building of a tank, and Sir Alfred Yarrow to present such a tank to the nation. This tank was opened in 1911 and forms part of the National Physical Laboratory, coming under the general administration first of Sir Richard Glazebrook, and more recently of Sir Joseph Petavel, the present Director of the Laboratory.

THE MAIN OBJECT OF TANK WORK.

It should be stated at the outset that the main object of tank work, both as regards research and tests, is to throw light on the problem of the economical running of ships. The cost of overcoming ship resistance is one of the largest items on the balance-sheet of any vessel in the mercantile marine. All the treatment in the world will not reduce this resistance beyond certain limits, at any speed, *once the ship is built*, and a given propeller cannot be made to develop a thrust beyond certain limits under given conditions. These limits are fairly definite, and the attainment of a working knowledge of them and their application to individual ships is the province of a tank and one of its principal uses. The National Tank was built to enable such work to be pursued on broad lines, and in a methodical manner. Researches have been carried out on many subjects, and the data so obtained have been most useful to shipbuilders and engineers as well as to shipowners. Of these researches mention may be made of the work in connection with the effect of bilge keels on the rolling of ships, the steering qualities of various rudders, the effect of rough water on the ability of a ship to maintain its speed, the effect of rake, immersion and the general design of propellers, and lastly on the effect upon the resistance of a ship's hull of variations in fullness of bow and stern, change of beam and in ratio of beam to draught, the formation of eddies at the stern, and the interaction between ship and propeller, and other such items which determine the efficiency of propulsion and the shape which should be given to hulls under different conditions of speed, length and displacement. Like many other scientific instruments, the tank cannot attain its end alone, or by its own unaided efforts. It depends upon the steady co-operation of the shipowner and his superintendent, in collecting data to check the model work —a most essential feature, in bringing to the notice of the tank any unusual features, bad results and other matters of moment in connection with propulsion, and in providing such financial assistance as will enable the tank to devote adequate time to the pursuit of any line of investigation. For scientific progress, in the main, results from methodical experiments, of which the application in any individual case may interest individual persons, but the pursuit of which as a whole benefits all in the industry, and should receive their financial support.

THE FORM OF SHIP'S HULLS.

It has already been suggested that the first endeavour of a shipowner is to obtain a form for the hull, suitable for the intended service. Unless he is able to copy an existing and successful ship, his best and most certain way of securing such a form is by tank tests. In the experiment tank, a model is made of the form of the ship, correct in every detail and weighing about 2,000 lbs., and its resistance at a series of speeds is determined. In some cases, model propellers similar to those it is proposed to fit on the ship are tried in their correct positions behind the model. The goodness or badness of the hull form, the efficiency of propulsion, and the character of the influence which ship and propeller each exert on the other are determined. These experiments can be made at any draught or



EXPERIMENT TANK AT THE NATIONAL PHYSICAL LABORATORY: CARRIAGE WITH MODEL READY FOR TEST.

trim considered by the owner as representing average conditions on service. If the proposed shape is not suitable, the tank will modify it so as to render the hull and its propeller as efficient as possible consistent with the dimensions, speed, etc., of ship. Such work has been in progress now for many years, and the wide and varied experience of the staff, their expert knowledge, and the large body of research data accumulated at the tank, are always at the service of the industry.

THE WORK OF THE TANK ON CARGO SHIPS.

It has been said, and many still think, that a tank is only really useful for high-speed vessels, and that little error can be made in the shape of a cargo ship. Model experiments, and actual experience, have shown that this is not the case. The majority of shipowners are acquainted with ships whose reputation as coal consumers and for bad time-keeping on service is anything but satisfactory. The variety of types of ships served by the tank can be best demonstrated by a summary of the models tested for firms during the twelve years ending June 1, 1923. This is given in Table I. For the purposes of tabulation, the models have been divided into five types or groups, defined broadly by their speed conditions. Included in these types are to be found several vessels for work in very shallow water, ordinary and railway ferry steamers, motor boats, barges, coastal tramps and coal carriers, as well as the more or less normal type of ocean ship. Included in the numbers are twenty-five models for nine standard ship designs tested for H.M. Government, which has been counted as one "firm" in the table. This table is interesting as showing not only variety of types, but the relative difficulty of obtaining a good result as defined by the ratio of number of models tested to number of designs. Although mail steamers have required the most work on each individual design, the amount of test work in connection with cargo ships represents a very high percentage of the whole. In addition to these tests of hull forms, twenty of the models have been fitted with screw propellers, and modifications of the latter, to secure higher efficiency, have been

TABLE I.—NUMBER OF MODELS AND DESIGNS TESTED FOR FIRMS.
(Models of flying boats, skimmers, and motor boats not included.)

Type of design.	Number of models.	Number of designs.
Destroyers.	41	18
Mail steamers	38	12
Liners	16	9
Intermediate steamers	23	12
Cargo vessels	262	101
Total	380	152

proposed in about one-half of these cases. Although the ratio of cargo vessels to all other designs tested looks high, it is no higher than might be expected, as some eighty per cent. of the mercantile vessels in existence are cargo vessels.

TABLE II.—RESULTS OF TESTS OF SHIP FORMS AND IMPROVEMENTS EFFECTED.

(The indicated horse-powers given in column 4 are based on an assumed propulsive coefficient of 0·5.)

Displacement.	Speed.	Effective horse-power.	Reduction of I.H.P. effected by tests.
Tons.	Knots.		
265	11·0	170	36
650	14·0	750	450
1,000	10·5	320	45
1,894	12·0	760	322
2,000	10·0	400	72
2,000	10·25	385	65
2,160	13·0	700	111
2,850	17·0	1,710	188
3,110	12·5	915	183
3,300	15·0	1,650	165
3,505	15·6	1,740	209
3,620	12·0	1,071	142
3,820	10·0	430	86
3,900	9·5	360	52
4,330	11·0	750	148
5,750	10·25	600	72
5,920	9·5	504	38
5,930	10·5	640	45
5,950	10·0	620	310
8,184	9·5	651	127
8,490	9·5	662	158
8,950	10·0	730	58
8,985	12·0	1,423	187
9,700	11·0	907	67
10,370	11·5	1,385	290
10,360	10·5	985	138
10,535	11·5	1,118	92
10,640	11·0	1,354	402
10,685	9·0	472	28
10,700	13·0	1,900	182
11,250	10·0	785	157
11,360	11·0	1,208	316
12,060	13·0	2,055	123
12,500	12·5	1,650	165
13,104	11·5	1,375	154
13,200	11·0	1,105	121
13,278	14·5	3,362	910
13,300	10·5	950	95
13,500	13·0	2,150	250
14,000	11·0	1,200	180
14,309	12·0	1,770	177
20,220	15·0	4,263	537
20,300	13·5	2,690	161
22,500	19·0	9,646	1,830
23,000	21·0	13,408	1,980

REDUCTION OF MACHINERY POWER EFFECTED BY MODEL TESTS.

Table II., above, gives some additional information as regards these tests for some selected cases, and shows the reductions in power effected in the tests. These reductions are obtained under conditions representing fine weather, but there is every reason to suppose that there is the same gain in rougher weather. In some cases, the reduction is very considerable, and beyond what seems feasible, but every case shown represents the final shape which would have been built had the form not been tested, and one of the outstanding cases represents a shape built at the time of the tests (and still presumably on the active list), and only tested when a repeat ship was being ordered. The reductions shown have been effected in very different ways on the different types and designs: by reduction of eddy-making at the stern, a matter to which considerable attention has been paid in recent years, shifting the centre of buoyancy fore and aft a little, dropping the floors and fining the ends, by increase of beam or the use of a little hollow in the water lines at the fore end. But, in any case, if the underwater form is defective, it will become apparent when the tests are made. Each type of ship is liable to certain troubles, which have to receive separate treatment, and the old proverb that one man's meat is another man's poison is well illustrated by the fact that in different types, and even in different designs of the same type, improvements are obtained by alterations of opposite character. It may be generally said that when displacement, length and speed are fixed, and beam approximated to, there is a form whose resistance is a minimum, any departure from which will involve more or less loss, and this form can only be determined from experiment data, or by model experiments.

TABLE III.—FINANCIAL RETURNS FROM TANK TESTS: TYPICAL CASES FROM TABLE II.

	Example 1.	Example 2.
Cost of tests	£190	£190
Displacement in tons	5,750	20,220
Speed in knots	10·25	15·0
Steaming days per year	242	242
Price of coal per ton	£1	£1
Reduction of horse-power	72	537
Annual saving in cost of coal	£233	£1,740
Return on capital expenditure	123%	901%

In addition to such gains as are mentioned above, the research work already completed with propellers, although very incomplete, has been sufficient to show that there is much to be learnt in this connection. In several cases, propellers with better efficiency have been proposed as a result of tests; in others their position or shape have been altered to give better working conditions, without in any way affecting the general design of the ship.

FINANCIAL RESULTS FROM TANK TESTS.

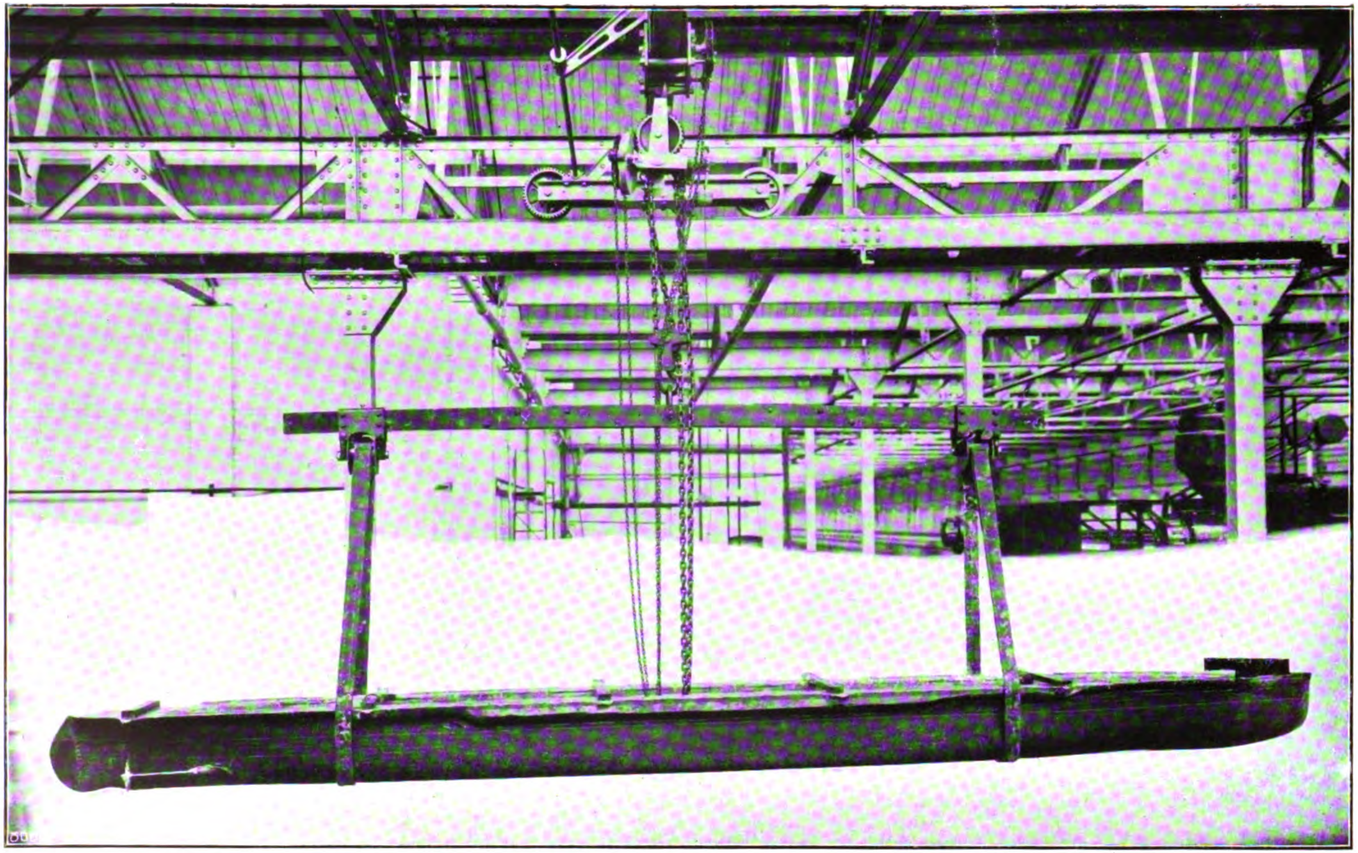
To give weight to these statements, and to show the meaning of a reduction in the power required for propulsion at any speed, two examples have been chosen from Table II., one an ordinary tramp doing 10·25 knots, the other an intermediate steamer doing 15 knots. The returns obtained in these two cases, assuming only one ship to be built to each design, and that one day in three the ship is not steaming, are shown in Table III. on page 315.

These results are *not* exceptional, and taken alone are sufficient justification for tank tests. But the greater economy in coal, the less coal has to be carried, the greater weight and space can be devoted to cargo, and the additional freightage adds considerably to the returns shown in Table III. In coastal "tramps" this is not a serious matter, but for long ocean voyages it is of great importance, as the ratio of weights of coal which must be carried and of possible cargo is very high. Moreover, as freight rates drop, the last vessels to be laid up would be those having the lowest coal consumption. Mr. J. Anderson has recently stated that "a reduction of 10 per cent. in resistance is equivalent to 4 per cent. on the freight rate at 10 knots, and 8 per cent. at 14 knots" for ocean vessels, and the propulsively efficient ship carries with it this advantage for all its life.

STUDIES OF PERFORMANCE OF SHIPS IN ROUGH WEATHER.

But it may be said that the business of the shipowner is to run his ships in all weathers, and these results are obtained under ideal conditions, not existing in practice. This aspect of the running of ships has received much more attention, and definite, useful data has been obtained in the last few years. It is known that ships of equally good performance in smooth water, differ very considerably in their weather qualities and in their ability to maintain reasonable headway in head winds or heavy seas. To be of real use to the shipowner, it is obvious that the tank staff should be acquainted with the conditions existing at sea, and for this purpose studies of the performance of several ships in rough weather have now been made by members of the staff, who have made several journeys in various ships. The actual pitching of the ships, the reduction of speed caused by heavy seas, and the variations of power, etc., at various speeds have been measured. In addition, very valuable data have been obtained from the captains of these ships and the superintendent engineers, on the various phases of ship running, all having more or less bearing on the subject of proper ship design. Such work must necessarily be correlated to model experiments, and for this purpose apparatus has been installed for making rough seas, varying from the long ground-swell to steep waves having breaking crests, or any mixture of these different types. A very complete series of experiments with models in waves is in progress, and the uses and effect of different form features, such as flaring bows, full or fine ends, etc., are being studied.

Alongside of this work are proceeding similar comparisons of the performance of ship screws at sea, and on steam trials under reasonably good conditions, with model screws both behind model hulls and in open water. The model experiments are necessarily twofold



EXPERIMENT TANK AT THE NATIONAL PHYSICAL LABORATORY: SELF-PROPELLED MODEL.

in character, being studies, in the first place, of the performance in individual cases for which good trial and voyage data are available, and secondly, of the general effect of changes in design, etc., which practical experience has shown to be of some importance. These experiments have, so far, been confined chiefly to the single-screw ship, but recently twin-screw vessels have been dealt with. The full-scale work, with ship and propeller under working conditions, cannot be carried out with anything like the precision or the fullness possible in model experiments. But it is being productive of broad results and some general conclusions as regards weather effect, and the proper shape of hull for certain sea conditions, to a better conception of the demands put upon both hull and propeller, and the effect of hull and propeller upon each other in rough as well as fine weather. Co-operation of the tank staff and the ships' officers, on these lines, and the analysis of steam trial data, are leading to a clearer definition of the manner in which acceptance steam trials should be carried out, so as to obtain both a real test of the propulsive efficiency of the ship, and of the available power in the engine-room. It is showing where discrepancies and large unexplained losses are occurring, the study of which can be nothing but beneficial to the shipowner. There are very many problems for which no solution has yet been found. In some cases, of course, the trouble cannot be altogether avoided, until the weather can be brought under control, but the attempt to understand these matters by isolated experiments on full-scale ships is necessarily a long-winded business, and owing to its piecemeal character is not likely to succeed, except by lucky chance. The accumulation of data on seaworthiness in one national institution, and its careful analysis, should go a good way towards steady improvement in the many things involved in the propulsion of ships. The whole object in these various researches is to help the shipowner to run his ship with greater economy and with more reliability as regards time-keeping, and to enable this country to produce the best ships in the world.

Research Undertaken for Individual Firms.

But besides this work of a direct character on ship propulsion, other researches of considerable usefulness to the shipowner have been, and are being, carried out in the tank. Many of these researches have been made or started to the order of a firm finding themselves in difficulties in connection with some feature of a particular ship or line of ships; others of a broader character have been made under the approval of an Advisory Committee on which the Institution of Naval Architects and the Chambers of Shipping are strongly represented. Table IV., on page 318, gives a general summary of the miscellaneous researches undertaken for individual firms, omitting all work of a purely war character. There is no necessity to enlarge upon these; some are restricted in character and of little importance, but others deal with matters which were seriously affecting the financial value of individual ships. In general, they deal with special problems, for which accurate data could not have been obtained in any other way.

What is more important, in almost every case of trouble, the source of that trouble has been disclosed by the experiments. When a ship is completed, alteration is a very difficult and expensive matter, and it is not usually feasible to adopt the requisite alteration to remove any trouble. But palliatives have been suggested in some of these cases and adopted with advantage to the ship.

TABLE IV.—MISCELLANEOUS RESEARCHES UNDERTAKEN FOR FIRMS AT THE NATIONAL TANK.

Effect of bilge keels on rolling	2 ships.
Determination of correct position of bilge keels, fore and aft, and along the stream flow	6 ,,
Rudder resistance	4 ,,
Shaft bracket and web alignment and resistance	5 ,,
Screw propeller trouble in full-ended ships	7 ,,
Effect of side bulges on resistance	3 ,,
Placing of wheels on paddle steamers for correct immersion . .	3 ,,
Shallow-water effect on resistance	5 ,,
,, ,, ,, steering	3 ,,
Suction between ships and effect of canal banks on steering . .	2 ,,
Steering in deep water	2 ,,
Sailing ship design	1 ship.
Rough-water effect on speed keeping	2 ships.
,, ,, ,, ,, hull strains, in oil tankers and in light ships	2 sets of experiments.

TESTS OF RUDDERS.

Amongst the recent systematic researches of a more general character, may be mentioned that on the steering of ships, and the measurement of the efficiency of different types of rudders. This is still in progress, but some results for single-screw ships have been published. The work with rudders on twin-screw ships has made considerable progress, and a paper giving the results so far obtained will shortly be published in Glasgow. Rudders of various shapes and sizes have been under test, and the forces on them have been reduced to rule, both when behind the ship with the propeller working, and when in open and undisturbed water. The tests with rudder behind the model have been made under conditions representing, as closely as possible, the ship conditions, first with the model restrained to keep its course when the rudder was put over, and later allowed to swing under helm, the helm being reversed whilst the model was swinging, to observe the increase in rudder strains due to the reversal of helm under different conditions of propulsion. All the systematic work has so far been done in deep water, but it has become apparent from isolated experiments, that shallow water has a considerable effect on steering. It appears to exaggerate the forces tending to cause the ship to move off its course, and at the same time to decrease the effectiveness of the rudder to check such movement. The problem has been partially studied by actual observations made by the staff on ships in the Suez Canal, and it is proposed to extend the research to cover this very difficult problem of steering large ships in confined waters, as time and opportunity occur.

It is characteristic of the undertaking of such researches, that within a short time of it becoming known, no less than six ships have been sent to the tank for their steering qualities to be studied and reported on, all of them having given trouble in this respect. These experiments have shown considerable and unsuspected differences in the steering qualities of ships, particularly in regard to the mode of propulsion. When completed, the data provided should form a reasonable basis for rudder design, and the knowledge of the general conditions at the rudder and the effect of various features, should enable the tank to tackle with success (as has been done already) the curing of troubles in existing ships. It is difficult to assess the value of the tank and its staff to the shipowner who may be harassed by such problems, which can only be treated by experimental methods. It is infinitely cheaper to carry out such experiments on a model scale, rather than on the ship with all the attendant risks of failure in the latter case. In presenting the tank to the nation, Sir Alfred Yarrow stated that it was for solving any problem of this character, and the staff have found that there are few troubles which cannot be explored, and often cured, by model experiments, and have always welcomed such work, no matter how unusual its nature.

Financial Support Needed.

It is a *sine quâ non* of such work that the staff must necessarily be possessed of all kinds of knowledge having any material bearing on ship propulsion, and for this two things are required. Firstly, the co-operation of shipowner and shipbuilder in the work—a condition already assured by the interest of many firms; and secondly, the continuous prosecution of such general research as appears necessary, so that data on matters likely to be important in the future shall be available, and only its application have to be considered in individual cases as they arise. But for the continuance of research work funds are required. The Institution of Naval Architects has for many years maintained a fund for this purpose, and thanks to the activity of Mr. R. W. Dana, its Secretary, with the exception of certain periods during the late war, the research work has continued without break since the tank was opened for public use in 1911. The chief contributors to this fund, however, have been the shipbuilders and marine engine constructors of the country, who have been responsible for some 90 per cent. of the funds. The advantages which such firms receive from the work, although very substantial, hardly fall within the scope of this chapter, but the above may be taken as a fair mark of their appreciation. In the last four years, the average annual contribution received from all sources has been only twelve hundred pounds, a sum so meagre that the Tank has been compelled to use its small reserve fund to maintain the continuity of its research. The total sum now being spent per year on industrial research work amounts to nearly five thousand pounds, and of this one-half must be raised from the industry. Taking twenty of the better samples of models tested, and assuming that only one ship has been built to each design, though actually many have been built to some of these, the net annual saving to the shipowners concerned in these ships, taking bunker coal at one pound per ton, *is forty thousand pounds*, and this represents only a small proportion of the gain arising from the work already done. In America the millionaire gives huge sums for the maintenance of research. In Germany and Austria the State provides for its endowment. In Great Britain the general attitude has been that an industry which has reached maturity should, to a large extent, support its own research. The proper realisation of these facts should compel both Chambers of Shipping and individual shipowners to take a larger and more practical interest in the welfare of the National Tank. The recent visit of many shipowners to the Tank, arranged by Sir Ernest Glover, President of the Chamber of Shipping of the United Kingdom, can perhaps be taken as an augury of greater appreciation in this direction.

To recapitulate, whilst business is pursued on competitive lines, the race is always to the fittest, and the British shipowner can satisfy himself as regards the most serious factor in the fitness of his ships, viz. the propulsive efficiency, by model tests. Such work is the main business of the National Tank, and is carried out by a trained staff, at short notice, at any time, for a comparatively small fee. The tank is also of use to the shipowner—

(*a*) In meeting unusual conditions necessitated by any trade, whether such conditions arise from shape of hull, port facilities, or propulsion.

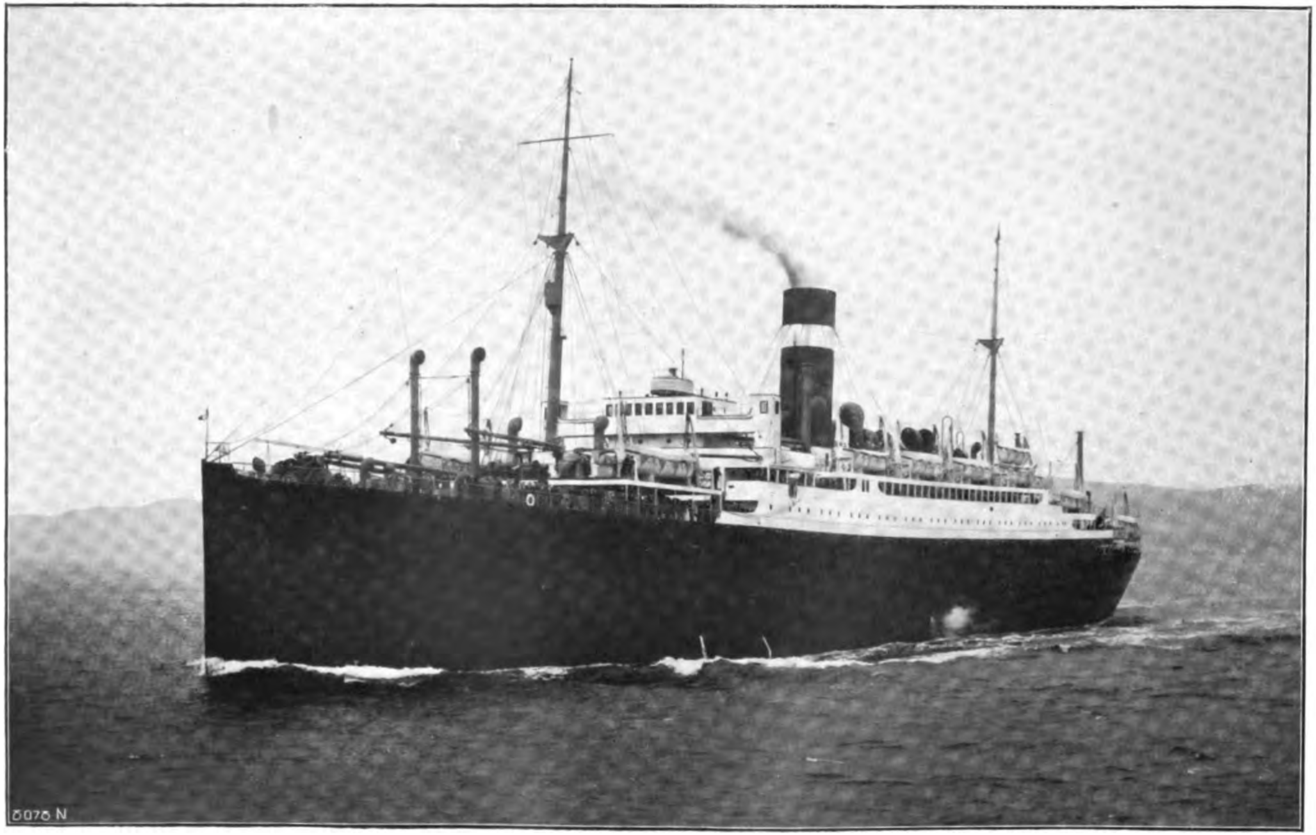
(*b*) In all matters connected with the working of the propeller, and in analysing steam trial and other ship data for efficiency of engine, propeller, etc.

(*c*) Where vessels have shown poor time-keeping in fine or rough weather, in determining the cause, and possibly remedying the defect.

(*d*) In most cases of bad steering in deep or shallow water.

All of these "uses" demand a steady supply of knowledge, and new data ready to hand for any case that may arise, and this involves the steady continuity of various researches. The shipowning industry should play its part in maintaining such research by contributing to its cost, and by co-operation with the staff in comparing model and ship with each other. The maintenance of this research fund has been the work of the Institution of Naval Architects for the last decade, and further funds are necessary even to maintain the work at its present level.

G. S. Baker.



(Photo: Maclure, Macdonald & Co., Glasgow.)

ANCHOR-DONALDSON LINER ATHENIA.

(Constructed by The Fairfield Shipbuilding and Engineering Co., Ltd., Govan.)

CHAPTER X.

THE SHIPPING SLUMP AND THE VALUE OF SHIPS.

THE following note records the results of analysing the prices obtained at the sales of 678 British ships during the period July 1, 1919, to June 30, 1922. This period commences six or nine months before the peak of the shipping boom in the first quarter of 1920, and ends at a point where shipping appears to have settled down at an unprofitable level to wait until the existing surplus tonnage is worked off.

The method used in the analysis is that of correlation coefficients and regression lines. Where, as in physical laws, the value of one variable quantity is completely determined by that of another, as for example the pressure of a perfect gas by its density, the correlation coefficient is unity—positive if the two variables increase together, negative if one increases and the other decreases. Where, however, as in statistical relations, the value of one variable depends on a large number of factors and the second variable is only one of these, the correlation coefficient is a fraction—positive or negative, and its value is a measure of the dependence.

TABLE I.—DISTRIBUTION ACCORDING TO AGE AND GROSS TONNAGE.

Gross Tons.	Age in Years.												
	0–5	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	
Under 2,000 . .	65	32	22	33	15	19	14	13	8	2	—	—	223
2,000–4,000 . .	94	28	29	55	35	21	13	3	—	—	—	1	279
4,000–6,000 . .	59	20	17	14	16	9	4	—	—	1	—	—	140
6,000–8,000 . .	23	2	—	1	3	3	1	—	—	—	—	—	33
8,000–10,000 . .	—	1	—	—	1	—	—	—	—	—	—	—	2
10,000–12,000 .	—	—	—	—	—	—	1	—	—	—	—	—	1
	241	83	68	103	70	52	33	16	8	3	—	1	678

The price realised per gross ton at the sale of a ship depends on a great many factors. Of these the chief are in normal times her age and her size. In a speculative industry like shipping, the date on which the sale takes place is also an important factor, and, in the period under review, this factor has been the most important of all.

The total tonnage included in the 678 shipping sales was

2,020,000 gross tons, and the sums realised were nearly £67,600,000. The age of the ships averaged 13·4 years, but the range of variation was very great; 241 of the ships were less than five years old, and one was nearly sixty years old. As regards size, 223 ships were under 2,000 gross tons, and one was over 10,000 gross tons, the average being 2,979·4 gross tons.

Table I., on page 321, shows the distribution of the vessels according to age and tonnage. The correlation coefficient between age and tonnage is

$$r_{at} = -0·165 \pm 0·024.*$$

The correlation is small but significant—during the period under review the ships sold shared in the general character of all ships in that, on the whole, the older ships are of smaller size.

Table II. gives the distribution of the vessels according to age and price realised per gross ton.

TABLE II.—DISTRIBUTION ACCORDING TO AGE AND PRICE PER GROSS TON.

£'s.	Age in Years.												
	0–5	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50	50–55	55–60	
Under 10 . . .	11	5	13	35	30	25	16	8	4	2	—	1	150
10–20	65	16	9	11	6	2	4	2	—	1	—	—	116
20–30	28	4	2	5	8	5	4	2	3	—	—	—	61
30–40	23	10	17	14	13	7	2	2	—	—	—	—	88
40–50	48	20	14	17	7	5	2	2	—	—	—	—	115
50–60	26	8	3	10	3	4	2	—	1	—	—	—	57
60–70	14	3	3	3	—	1	1	—	—	—	—	—	25
70–80	7	7	2	4	3	3	2	—	—	—	—	—	28
80–90	6	7	3	3	—	—	—	—	—	—	—	—	19
90–100 . . .	6	3	1	1	—	—	—	...	—	—	—	—	11
100–110 . . .	4	—	1	—	—	—	—	—	—	—	—	—	5
110–120 . . .	—	—	—	—	—	—	—	—	—	—	—	—	—
120–130 . . .	3	—	—	—	—	—	—	—	—	—	—	—	3
	241	83	68	103	70	52	33	16	8	3	—	1	678

The correlation coefficient of age and price per ton is

$$r_{ap} = -0·298 \pm 0·024.$$

The coefficient is again negative, numerically greater than in the case of age and tonnage and over eleven times the probable error. We get here also a numerical measure of the known fact, that other things being equal, the older ships fetched lower prices, and that the connection between the age and price per ton of a ship is stronger than that between her age and size.

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* The 0·024 is the probable error—unless the statistical constant, here the correlation coefficient, is about three times the probable error, its value is not significant, the correlation being simply the result of random sampling.

HIGH PRICES FOR TONNAGE.

Table III., on this page, deals with the distribution of price per gross ton and tonnage. For example, of the 678 ships, 279 were of 2,000 and under 4,000 gross tons, and, of these, 59 fetched a price per gross ton of £40 and under £50.

The correlation coefficient of price per gross ton and tonnage is

$$r_{pt} = -0{\cdot}249 \pm 0{\cdot}024.$$

This coefficient is also significant, being over ten times its probable error. Other things being equal, smaller ships fetch a greater price per gross ton, but since r_{pt} is numerically smaller than r_{ap} it follows that size is not quite so important a factor as age in determining the price.

In normal times, these coefficients would by themselves be sufficient to describe the dependence of the price realised per ton at the sale of the ship in the open market on certain general factors. The correlations are moderate but definitely significant. Their moderate value is an indication of the existence of other factors of importance, as for example the suitability of the vessel for certain special trades, in so far as that is not sufficiently determined by size. But during the period July 1919 to July 1922, a factor of a totally different kind comes into prominence. If we separate the period into twelve quarters and denote by d the date of sale, so that $d = 1$ corresponds to all vessels sold in July, August, and September, 1919, $d = 2$ to sales in October, November, and December, 1919, and so on, $d = 12$ corresponding to sales in April, May, and June, 1922, we may now form tables showing the relations of age, size, and price realised per ton, with date of sale.

TABLE III.—DISTRIBUTION ACCORDING TO PRICE PER GROSS TON AND GROSS TONNAGE.

Gross Tonnage.	£'s per gross ton.													
	Under 10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	120-130	
Under 2,000.	42	36	19	16	13	18	15	27	18	11	5	—	3	223
2,000-4,000 .	66	44	33	45	59	25	6	—	1	—	—	—	—	279
4,000-6,000 .	33	24	7	22	37	14	2	1	—	—	—	—	—	140
6,000-8,000 .	7	12	2	5	5	—	2	—	—	—	—	—	—	33
8,000-10,000	1	—	—	—	1	—	—	—	—	—	—	—	—	2
10,000-12,000	1	—	—	—	—	—	—	—	—	—	—	—	—	1
	150	116	61	88	115	57	25	28	19	11	5	—	3	678

Table IV., on page 324, shows the distribution of periods of sale and gross tonnage. As three years is a comparatively short time in the history of shipping we should expect no significant correlation between the size of a ship and the date of sale. On an average, (except for the variations due to chance) we should expect the ships sold in the first quarter to be of much the same size as those sold in the twelfth. The analysis is confined to British vessels. If the ex-German vessels had been included, the homogeneity would, of course, have been destroyed, as the sales of the large ex-German ships took place in the later portions of the period.

TABLE IV.—DISTRIBUTION ACCORDING TO PERIOD OF SALE AND GROSS TONNAGE.

Gross Tons.	Period of Sale (*d*).												
	1	2	3	4	5	6	7	8	9	10	11	12	
Under 2,000 . .	27	30	50	23	5	4	3	5	14	24	17	21	223
2,000–4,000 . .	54	58	41	8	10	8	8	13	17	23	22	17	279
4,000–6,000 .	23	31	17	7	4	6	—	1	9	19	18	5	140
6,000–8,000 . .	2	9	1	—	1	—	—	5	2	7	4	2	33
8,000–10,000 . .	—	—	—	—	1	—	—	—	—	—	1	—	2
10,000–12,000 . .	—	—	—	—	—	—	—	—	1	—	—	—	1
	106	128	109	38	21	18	11	24	43	73	62	45	678

Actually the correlation coefficient between the date of sale and tonnage is $r_{dt} = 0{\cdot}043 \pm 0{\cdot}026$, and is not significant, being less than twice the probable error.

Table V. deals similarly with the age and date of sale.

TABLE V.—DISTRIBUTION ACCORDING TO PERIOD OF SALE AND AGE IN YEARS.

Years.	Period of Sale (*d*).												
	1	2	3	4	5	6	7	8	9	10	11	12	
0–5	35	59	25	14	9	11	5	9	13	23	25	13	241
5–10	12	20	24	4	2	—	1	2	3	6	8	1	83
10–15	11	14	13	5	—	1	1	—	8	8	4	3	68
15–20	16	23	15	2	5	1	2	4	5	14	5	11	103
20–25	17	3	10	4	2	—	1	3	6	12	9	8	70
25–30	8	5	7	3	2	2	1	2	2	6	7	7	52
30–35	8	2	9	3	1	2	—	3	3	2	2	3	33
35–40	2	2	3	2	—	—	—	1	1	—	2	3	16
40–45	2	—	2	1	—	—	—	—	—	2	—	1	8
45–50	—	—	1	—	—	1	—	—	1	—	—	—	3
50–55	—	—	—	—	—	—	—	—	—	—	—	—	—
55–60	—	—	—	—	—	—	—	—	1	—	—	—	1
	106	128	109	38	21	18	11	24	43	73	62	45	678

The correlation coefficient between age and date of sale is

$$r_{ad} = 0{\cdot}094 \pm 0{\cdot}026.$$

This coefficient is small, but probably has some significance as it is three or four times greater than the probable error. On the whole there was a tendency for ships sold in the later quarters to be slightly older, due probably to a falling off in the numbers of new vessels launched in the second half of the period. An inspection of the first line of the Table shows that of the 241 ships under five years of age sold during the three years, more than half were sold in the first year, July 1919 to July 1920.

"THE GREATEST SLUMP ON RECORD."

Table VI., on this page, gives the distributions of price per gross ton and date of sale. It will appear that what would in normal times have been a factor of limited weight, even in a trade so speculative as shipping, proved during 1919 to 1922 the most important of all.

TABLE VI.—DISTRIBUTION ACCORDING TO PERIOD OF SALE AND PRICE PER GROSS TON.

£'s.	Period of Sale (*d*).												
	1	2	3	4	5	6	7	8	9	10	11	12	
Under 10 . . .	1	1	8	1	1	2	2	15	22	47	24	26	150
10–20	3	1	4	2	3	3	3	6	17	26	35	13	116
20–30	12	12	13	3	4	1	4	2	3	—	1	6	61
30–40	27	29	14	3	5	5	1	1	1	—	2	—	88
40–50	40	44	18	8	4	1	—	—	—	—	—	—	115
50–60	12	19	15	6	—	4	1	—	—	—	—	—	57
60–70	7	7	7	2	1	1	—	—	—	—	—	—	25
70–80	1	8	16	2	—	1	—	—	—	—	—	—	28
80–90	1	6	9	2	1	—	—	—	—	—	—	—	19
90–100 . . .	2	1	2	6	—	—	—	—	—	—	—	—	11
100–110 . . .	—	—	—	2	3	—	—	—	—	—	—	—	5
110–120 . . .	—	—	—	—	—	—	—	—	—	—	—	—	—
120–130 . . .	—	—	1	—	2	—	—	—	—	—	—	—	3
	106	128	109	38	21	18	11	24	43	73	62	45	678

The correlation coefficient of date of sale and price per gross ton is

$$r_{pd} = -0{\cdot}661 \pm 0{\cdot}015.$$

The coefficient is forty-four times the probable error.

The familiar fact that a shipping boom culminating in the spring of 1920 was followed by the greatest slump on record is here measured numerically. The magnitude of the coefficient (greater than the correlation coefficient between stature of father and son) shows that the slump affected ships of all kinds. The negative sign shows that the fall after 1920, by its intensity and duration, swamped any lingering effects of the boom which was still in being from June 1919 to April 1920.

It is possible by means of well-known formulæ* to calculate what are known as partial correlation coefficients, *e.g.* the correlation of age with price for constant date of sale, and so forth. Seeing the bias given to the price by the date at which the sale was effected, we will calculate these partial correlation coefficients in order to see what relations might be expected.

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* $${}_{z}r_{xy} = \frac{r_{xy} - r_{xz}r_{yz}}{\sqrt{(1 - r^2_{xz})(1 - r^2_{yz})}}$$

For constant date of sale—
correlation of age with price is ${}_{d}r_{ap} = -0{\cdot}315 \pm 0{\cdot}023$
" " price with size is ${}_{d}r_{pt} = -0{\cdot}294 \pm 0{\cdot}025$
" " age with size is ${}_{d}r_{at} = -0{\cdot}170 \pm 0{\cdot}024$

These are now independent of the date of sale and are in each case slightly higher than before correction.

We may similarly work out the partial correlations of price realised and date of sale for age kept constant, for size kept constant, or for both age and size kept constant. The last of these is ${}_{at}r_{pd} = -0{\cdot}683 \pm 0{\cdot}014$, slightly greater than the uncorrected value $-0{\cdot}661$ obtained above.

THE REGRESSION EQUATIONS.

The data may be used to construct prediction formulæ giving the average price of vessels of given age, size, and so forth. We will give the two most interesting.

$${}_{at}\bar{p} = 42{\cdot}985 - 3{\cdot}964d,$$

or for constant age and constant size the average price $\bar{p}$ in £'s per gross ton realised by vessels sold in the dth quarter was £43 $- 3{\cdot}96d$, *i.e.* during the three years the price of tonnage dropped on an average nearly £4 per ton per quarter.

$$\bar{p} = 62{\cdot}9 - 0{\cdot}0038t - 0{\cdot}64a - 3{\cdot}96d$$

is the regression equation giving the average price per ton realised by vessels aged a years, measuring t gross tons, and sold d quarters after the first quarter of 1920.

Roughly speaking, to find the average price per gross ton realised at the sales of vessels of any age and size, sold at any time since the middle of the first quarter of 1920, we must from £62 18*s.* per gross ton deduct £3 16*s.* for every 1,000 gross tons, deduct 13*s.* for every year of age, and deduct £4 for every three months from February 1920 (*i.e.* the middle of the quarter) up to the date of sale. For sales in previous quarters the last deduction should be converted into an addition.

GRAPHICAL REPRESENTATION OF THE COURSE OF PRICES DURING THE PERIOD.

Diagram I., on the opposite page, gives the average prices from the crude Table VI. Prices of tonnage were rising in 1919, and by the first quarter of 1920 had risen to £58 18*s.* a gross ton. From the first quarter of 1920 to the second quarter of 1921 there was a sheer drop to £10 8*s.* per ton, an average fall of £12 2*s.* per quarter in the price per gross ton. During the remainder of the period a slight recovery took place, and the average price rose to £12 16*s.* per ton—an average increase of 12*s.* per quarter per ton.

FLUCTUATIONS OF PRICE.

Diagram II. shows the fluctuations in the price of second-hand tonnage, of the index number of shipping freights, and of the price of a new ready cargo steamer of 7,500 deadweight tons. In all these curves the average for 1920 is taken as 100.

On the whole, the movements are very similar, but whereas freights reached their peak in the first quarter of 1920, the price of new and second-hand tonnage continued to rise for another quarter.

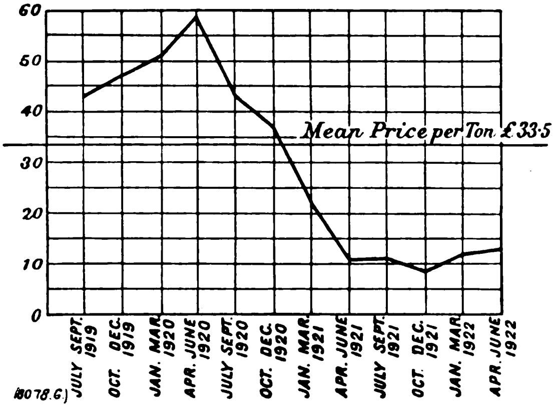


DIAGRAM I.

Speculators had not realised that the boom was at an end. On the other hand, at the worst period of the slump at the end of 1921, the price of second-hand tonnage dropped far more than might have been expected from the mere fall in freights. Many ships were already laid up, and there could have been very little speculative purchasing.

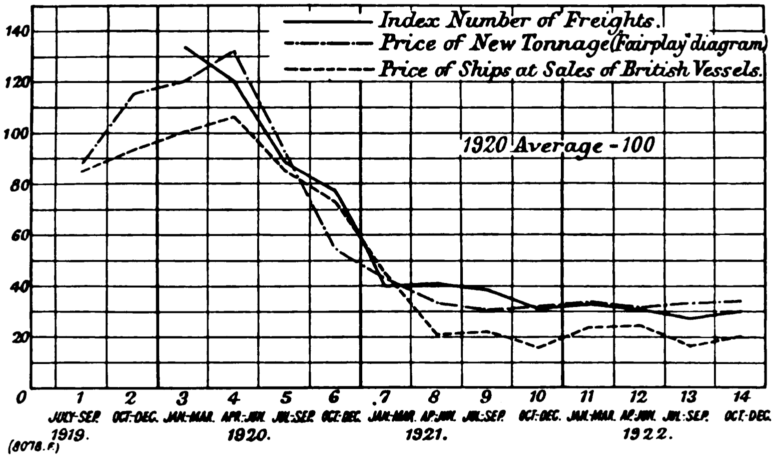


DIAGRAM II.

The diagram illustrates a common phenomenon in all speculative trading. The speculator is optimistic during the boom, and is not convinced it is over when the peak is reached; on the other hand, he is sceptical during the slump and will not believe that a recovery is taking place. The history of freights during 1922 and 1923 shows that, in this instance, the scepticism was well justified.

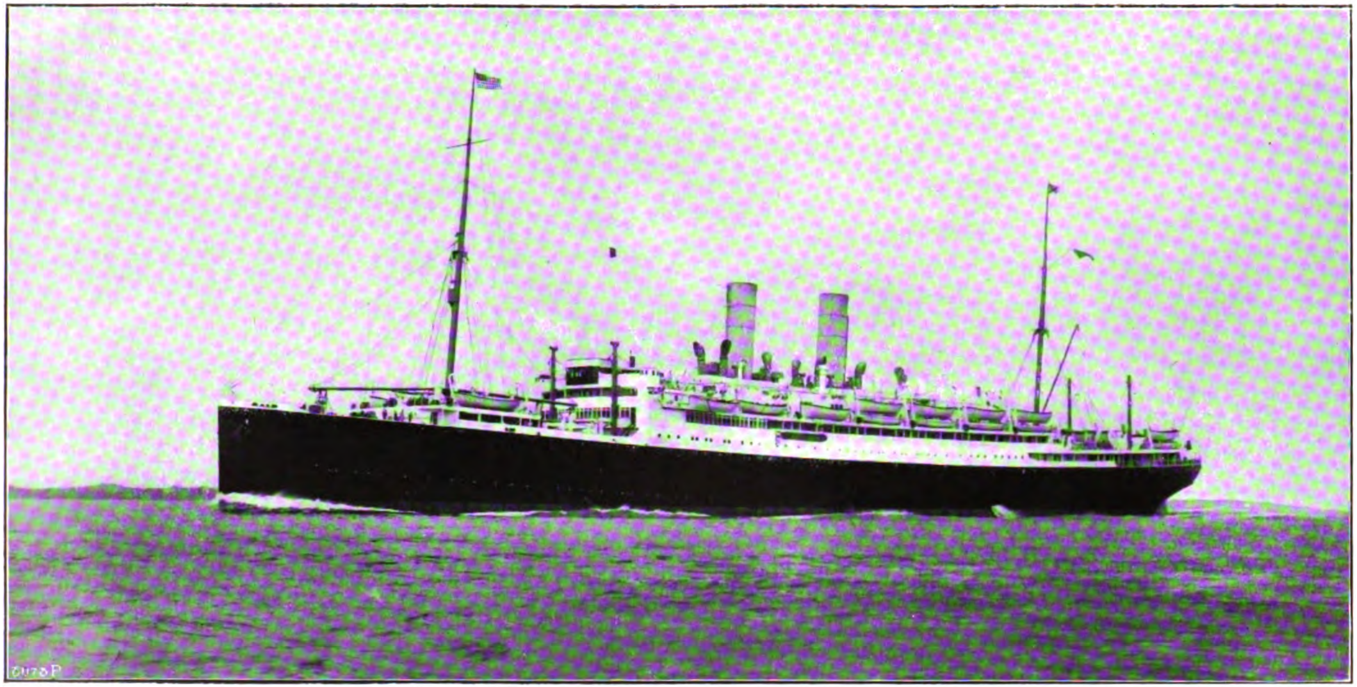
L. ISSERLIS.

CHAPTER XI.

THE LOW COSTS OF SEA TRANSPORT.

THE cost of sea transport was assured a place in the deliberations at the Imperial Economic Conference this year. The Conference was concerned with the promotion of commerce between the British Nations and, in the exchange of views on this subject, the facilities for, and the costs of, transport were bound to receive attention. It is significant that those who receive the rates of freight, *i.e.*, the shipowners, were anxious that the questions should be discussed. People who invite, and even urge, examinations are not those who have something to hide. A man of any sense who has a weak case knows that, in public discussion, it will be torn to shreds. He will therefore do much to avoid ventilation of it and will doubtless be able to produce a host of reasons to prove, if necessary, that the subject is too complicated to be considered by any one who has not all the points at his fingers' ends, which usually means that he alone, in his view, is fitted to be judge. He will also doubtless advance apparently good reasons why discussion could serve no useful purpose.

On the other hand, when people invite the fullest investigation they are either playing a game of bluff, or they are perfectly serious. To attempt to play such a game of bluff is the recourse of desperate men. They must know that, if their offer is accepted, they will be discredited. No one could suppose that the leaders of the British shipping industry, certainly one of the greatest industries of the country, are in the position of desperate men, and so, when they invited discussion of the costs of sea transport, they were in earnest. They did so in no spirit of self-complacency. They had no wish that statesmen should travel many thousands of miles from the Dominions overseas and interrupt their pressing work to listen to a series of platitudes. In order that decisions might be taken as to the best means of promoting commerce between the British Nations, all the possibilities needed to be explored. Within the range of subjects fall questions of production, markets, financing, insurance, getting the goods to the port of shipment, loading them, shipping them, taking delivery of them, forwarding them to the place of consignment, offering them for sale, and trying to ensure that the people shall have money to buy them. Transport of the goods across the oceans is one of the services that have to be performed between producers and consumers; but it is only one link in a chain. Yet people often think and speak as if the actual transport were the only thing that mattered, and, during the war, when prices rose to prodigious levels, freights were blamed; shipowners were branded as rapacious.



ROYAL MAIL STEAM PACKET LINER OHIO.

Perhaps it is that a ship is something that people can see, while all the other services by which vast numbers of people earn their living, do not stand out so clearly and form a less easy target for the missiles of criticism. To those who visualise the multiplicity of stages through which goods produced in one quarter of the world must pass before they can reach the buyer in another quarter, the wonder is, as a rule, that prices are not far higher than they are.

FREIGHTS AND PRICES.

Even during the war period, when prices of foodstuffs were very high, there were authoritative statements that rates of freight, although they rose as the supply of tonnage steadily decreased, were not responsible to any considerable extent for the rise in the cost of living. There was the definite statement of Mr. J. M. Robertson who, speaking in the House of Commons on July 3, 1917, as Chairman of the Departmental Committee on Food Prices, declared that the high rates of freight had nothing to do worth mentioning with the increases in prices of food. Again, two or three weeks later, on July 20 of the same year, Mr. Clynes, one of the Labour Members, told the House of Commons, as Parliamentary Secretary to the Ministry of Food, that shipping rates had no important bearing on the cost of the principal articles of food. In their annual report for 1918, the Liverpool Steam Ship Owners' Association thought it well to emphasise the point. They recalled that, as was shown in the Association's Report for 1916, while the freight on the wheat for a quartern loaf advanced by ¾*d.*, the price of a loaf increased by 4¼*d.* The freight rates for sugar rose by one-third of a penny and the price of the commodity by a 1½*d.* a pound. Meat freights advanced by a ½*d.* and the price of beef by 6½*d.* a pound. Those were times of shortage of tonnage such as the world had never known before. There was general recognition throughout the world that the supply of tonnage fell far short of the needs. All the Allied and Associated Countries, and notably the United States, were urged to bring every possible effort to bear on meeting the deficiency.

The rise in freights during, and immediately after, the war was due, partly, to an abnormal increase in working costs. To-day, owing to all the construction that has taken place and to a diminution of the world's commerce, following the inabilitv of vast populations to trade, the supply of tonnage far exceeds the demand. In many cases rates of freight are now below pre-war level, in spite of the fact that working costs are still much above the pre-war standard. If, in a time of extraordinary scarcity of tonnage, freight rates represented no large proportion of selling costs, it is quite clear that they would not do so when shipowners are striving to square their yards and, being unable to do so in many hundreds of cases, have been compelled to lay up their vessels in port.

AUSTRALIA'S BITTER EXPERIENCE.

While the level of freight rates has been a matter of particular interest to the representatives of the British Nations assembled at the Imperial Conference, it applies equally to trade with foreign countries. The subject of freight rates between the British Nations is of immense importance because of the distances, amounting to thousands of miles, which separate them. If rates of freight did represent a serious proportion of selling prices, then a barrier would have been raised against inter-Imperial trade which, somehow, would have had to be removed or broken through. It was the scarcity of tonnage during the war period which influenced Australia to experiment with a fleet of State-owned ships. The experiment, from the financial point of view, was started under most favourable conditions. The ships acquired were exempt from taxation, whereas the taxation of the earnings of British shipping companies became increasingly heavy, while the State-owned ships were assured of satisfactory employment not only during the war but for nearly two years afterwards. Yet that favourable start has not prevented the Commonwealth Government Line from involving the Australian people in very heavy financial losses. There was, only at the beginning of this year, the case of the freight to this country on Australian apples. Both the Commonwealth Government Line and the shipping companies, in deference to urgent representations from the growers and the merchants, reduced the rates of freight, although it had previously been admitted on behalf of the Commonwealth Government Line, that lower rates of freight would not be justified. The Commonwealth Government Line reduced its rate to a level to which the shipping companies would not go. They contended that, while working costs remained on the existing level, bedrock rates had been reached. A State-owned mercantile fleet may, for a time, carry goods at a loss, but, sooner or later, the mass of the people will object to paying for the subsidising of one section. Canada's incursion into State ownership was the direct result of the war measure which led to the creation of a new mercantile fleet. The Canadian Government, through the shipping organisation established for the purpose, has endeavoured to trade the vessels in the interests of Canadian commerce. It has also involved the Canadian people in financial loss. The costly experience of the Australian and Canadian Governments, running into many millions sterling, has shown that the vessels were carrying cargo at uneconomic rates, or were inadequately employed, or that the management costs were too high. If the vessels were insufficiently utilised then the case for their continued existence falls to the ground. Management costs could not possibly have accounted for the losses, and so the remaining conclusion is that the rates of freight were inadequate. Experience has tended to show the reasonable character of the freights quoted by the shipping companies.

The overseas trade of the United Kingdom and the British Dominions is open to the ships of all nations; so is that of foreign countries. This fact is itself a guarantee for importers and exporters that rates of freight will always be restricted by keen competition. It is unquestionable that the working costs of the shipping of some nations are lower than the corresponding costs of the British mercantile marine. These lower expenses may be, and are, a real trouble to British owners. The latter must either be able to carry at the same terms or, at any rate in times when the supply of tonnage is greatly in excess of the demands, they must go out of business. But while such conditions are really serious for British owners, they do benefit, up to a point, British merchants. They ensure that the rates of freight which British owners consider reasonable, shall always be subject to the rates of freight which ships worked at lower cost can accept. In opening their ports to ships of every flag, the nations do provide for their people a guarantee of competition.

SHIPS VERSUS RAILWAYS.

It is doubtless this element of competition which is one of the main influences in ensuring very moderate rates of freight. Although the countries, especially those of the British Empire, are separated by such great distances from each other, no toll has to be paid for the use of the high seas; they are open to all alike. Shipping companies, unlike railway companies, have not to consider the construction and upkeep of expensive permanent ways. The construction of the metal roads is naturally one of the chief items of expense to railway companies, and explains why the capital of railway companies is, as a rule, far in excess of that of the largest shipping companies. A large shipping company may have a total capital of several millions, while a large railway company, as originally formed, may have a capital of scores of millions. It is not the purpose of this chapter to explain or justify railway rates, but a moment's thought will show that the construction of permanent iron roads through densely populated areas, the building of great bridges and long viaducts, and the boring of tunnels must involve very heavy initial cost. This outlay is represented by capital, and to the earning of interest on this vast outlay all passengers and goods which pass over the line have to contribute. Not only is there the original outlay to be considered, but there is the continual expenditure for maintenance. And when the permanent way has been prepared, there are the engines and the rolling stock to be constructed and kept in working order.

The shipowner has to provide his engines and rolling stock, combined in one unit, but he has no permanent way to build and keep in perfect order. From that expenditure he is happily relieved. The capital he needs will be confined mainly to the cost of building his ships and to providing such organisation as may be needed ashore. If his activities be restricted to the ownership or management of ordinary cargo steamers, his office equipment may be confined to two or three rooms, in addition to which he will probably need membership of a shipping exchange. His capital outlay will certainly be far less than that needed by those who contemplated building and maintaining a railway. There will be no expensive Parliamentary powers to obtain at the outset. On the other hand, he can look forward to no monopoly such as railways enjoy as one of their rewards for their expenditure, and he will have to face heavy port charges, contributions to light dues, and the costs of pilotage, etc. Again, if he contemplates owning ordinary cargo steamers he will have to face the rise and fall of freight rates daily, and will have to meet the competition of all the world, of ships subject to different and, possibly, far less exacting laws than those of his own country, and manned, in many cases, by crews accustomed to a lower standard of living and earning far lower wages than those he must employ. He will have to face the competition of countries whose men are driven to the sea because their own lands offer no possibility of adequate employment. In short, he will be entering on one of the most speculative trades in the world.

ADVANTAGES OF SEA TRANSPORT.

It is only right to make these comparisons because they tend to explain why sea transport is so much cheaper than transport by rail. Free competition is one factor; smaller capital expenditure is another. A third is the power to transport goods in bulk. One of the cheapest forms of railway transport is the haulage of a train of coal wagons from a colliery to the port of shipment. That represents, probably, the nearest approach to the sea transport of goods in bulk that a railway can offer. An ordinary railway truck will hold from ten to twelve tons of coal, and a railway train may consist of some thirty waggons. That gives for each fully laden train a carrying capacity of from 300 to 400 tons of coal. A moderate-sized cargo steamer will carry some 6,000 tons. Therefore, to fill a single steamer some fifteen to twenty fully laden coal trains will be required. And on the basis of 300 tons for each train, and a cargo of 10,000 tons, more than thirty-three trains would be needed. In the haulage of these railway trains many men and many engines would be employed before the large holds of the ships could be filled. Further, there is wastage for the railway companies when all the wagons are not in use.

Bulk cargoes are the cheapest to carry by sea, and they represent the main imports and exports of the United Kingdom. Coal is the chief export and grain the chief import. Both are carried in bulk, although grain is also sometimes transported in bags. Much will depend on the economy of the arrangements for loading and discharging the commodities, a fact which has been recognised to the full on the Great Lakes of North America, where the ships have been especially designed for discharging coal at the head of the Lakes and loading grain and ore, and discharging these commodities at the ports at the foot of the Lakes in the shortest possible time. There is the keenest competition between those in charge of the great loading and discharging plants at the ports to get the work done within the shortest time.

Under such conditions only can the maximum efficiency be reached. The great ships—some of the longest in the world—with their engines aft, are designed for carrying the greatest possible quantities, and for loading and discharging quickly, because it is recognised that upon these factors the cheapness of transport largely depends.

SHORE CHARGES OF OCEAN COMMERCE.

To what extent loading and discharging figure in rates of freight is certainly not generally realised. The rates of freight are the only income on which shipowners can rely to pay their working costs. These charges include the wages of the crew and of the workers ashore employed in loading and discharging the cargoes; the coal, stores and food consumed on the voyage; the port and light dues; and the cost of repairs, renewals, and overhaul. In the report of the Liverpool Steam Ship Owners' Association for 1920, the striking statement was made that, under normal conditions, these expenses represent nine-tenths of the gross freights earned, and that only the remaining one-tenth remains to meet depreciation and interest on the capital employed. If rates of freight sufficient to cover the expenses cannot be earned, then those expenses must either be stopped entirely by laying up the ships or reducing them within the possible earning power.

The effect of high port charges was emphasised at the annual meeting of the Chamber of Shipping in 1923. Sir Ernest Glover, the President, instanced the case of a steamer loading 8,000 tons of wheat in Australia at a freight rate of 40*s.* a ton. The commission and tax he puts at £1,000 or £1,100. The port charges, costs of loading in Australia, are admittedly high, so that a steamer of this size would leave, approximately, £2,500 or £2,600 behind her in Australia. In the United States and Canada the loading charges are not increased by wheat "pooling" expenses and income tax, so that the total charges in loading such a cargo would only be in the region of £1,000 or £1,200. Since attention was then called to the level of the port charges in Australia, the subject has been further discussed, especially in connection with taxation and pilotage costs. The taxation question is a particularly serious one, because in the Dominions it has been customary to tax the ships on an assumed profit based on 10 per cent. of the gross earnings, which has meant that in numerous cases losses, and not profits, have been taxed. Quite lately the Federal income tax has been substantially modified.

The Australian and New Zealand trades are notable for the transport of refrigerated produce. This means that the ships have to be insulated and special machinery installed. Special engineers are also carried to watch over the refrigerating machinery throughout the voyage, and the ships are of a particularly expensive type. In the Australian and New Zealand trades the whole of the cargo space is not insulated, in order to allow for the carriage of wool and other produce in the ordinary holds. The cost of the insulation and refrigerating machinery may be regarded as representing about one-fourth of the total cost of such ships. In the vessels specially designed to bring frozen and chilled meat from South America the cost of the special equipment may represent quite one-third of the total cost of the ship and her machinery. Ships of this class are so distinct from the ordinary type and so costly that the trade offers no attractions to persons contemplating taking their luck in the freight markets of the world, with their daily fluctuations in rates of freight

It will be recognised from what has been written, that there is no desire to attempt to display railway rates in an unfavourable light. The conditions of transport by land and by sea vary widely, and what it is hoped to show in this chapter is that commerce between the British Nations is not handicapped by high freights. On the other hand, although the distances are great, the costs of transporting goods by sea, especially when represented as a proportion of selling prices, are very low indeed. The facts are not sufficiently appreciated. Only in August 1923, the Standing Agricultural Committee of the New Zealand House of Representatives, reporting on the proposals of the Farmers' Union and producers to establish a Shipping Board, stated that heavy freights were prejudicing Dominion industries. In point of fact, the Dominions are, in this respect, well off.

COMPARATIVE COSTS.

Some comparison between shipping and railway rates can easily be made, because a large number of examples of rates by goods trains were included in a pamphlet recently issued by the Railway Clearing House. The shipping rates are also obtainable, but it should be pointed out that those now to be mentioned were current in mid-summer, and, in some cases, the tendency has since been downwards. It is, indeed, difficult to see any possibility of general upward movement, at any rate, until trade greatly improves and there is less margin between the available supply of shipping and the demand for it. Too often now owners are simply concerned in trying to make both ends meet, and in avoiding the cost of laying-up. As regards vessels carrying cargo only, very few voyages can now be made at a profit.

Numerous examples have been given of the cost of carrying bacon and hams by rail. These show that the cost of transporting these commodities between such points as London and Peterborough, Liverpool and Glasgow, and Bristol and London, ranges from 5 to 7½ lbs. for one penny. The rates given as examples include, in some cases, collection and delivery; in others they are "Station to Station" rates, and in one or two instances they apply to traffic carried at owner's risk. The corresponding rate for the carriage of similar commodities from the United States to the United Kingdom, a distance of some three thousand miles, is equivalent to 5 lbs. for a penny.

The railway "C and D" rate for tea from London to Manchester is equivalent to ·40*d.* per lb., or, 2½ lbs. for one penny. The shipping freight for tea from India to the United Kingdom represents the transport of 4 lbs. for one penny. The railway rates for sugar range from 4½ to 14½ lbs. for one penny. But one of the rates which is, apparently, most favourable is only for "Station to Station" carriage, and the example of 14½ lbs. for one penny is that for 2-ton lots, "S. to S." from London to Ipswich. The "C and D" rate between Bristol and Sheffield is equivalent to 4½ lbs. for one penny. The sea freight between Cuba and the United Kingdom, a distance of some 4,000 miles, is equivalent to 10 lbs. for one penny. Cheese is carried on the railways in the United Kingdom at rates equivalent to from 4 to 10 lbs. for one penny. Thus the rate between Liverpool and Nottingham, providing for carting in Nottingham in 2-ton lots in boxes, etc., is equivalent to 5 lbs. for one penny. The shipping freight from Canada to the United Kingdom represents 3½ lbs. for one penny.

Flour is carried by railway between London and Birmingham in 2-ton lots, "C and D," at the equivalent of 6½ lbs. for one penny. The shipping freight on flour between New York and the United Kingdom represents the transport of 18 lbs. for one penny.

THE BENEFIT OF SEA CARRIAGE.

The most favourable example given for railway transport of meat is that for the journey between Liverpool or Birkenhead and Sheffield for 3-ton lots carted in Sheffield. The rate is equivalent to 5 lbs. for one penny. The "C and D" rate between Liverpool or Birkenhead and London is equivalent to only 2½ lbs. for one penny. The shipping freight from Argentina to the United Kingdom is equivalent to $1\frac{1}{32}$ lbs. for one penny, a distance of 6,000 miles. During the whole of the voyage the refrigerating machinery, it should be remembered, has to be kept working.

The railway rates, it is pointed out, take into account the reductions effected since January 1, 1923, in the terms for the conveyance of general merchandise, including foodstuffs in daily use in the household. These reductions, it is intimated, should enable the industries of the country to effect substantial savings in transport charges, and it is the hope of the railway companies that the modifications will assist in the much-needed revival of trade. There is a prevailing impression that railway rates account for a large proportion of the prices of commodities, but, whatever the charge may be for articles in daily use, the cost of transport is relatively small in proportion to the price paid by the consumer. While the proportions of the railway rates to selling prices of commodities are small, it is clear that the proportions represented by the steamship freights are still smaller.

A good illustration of the low proportion that freights represent is provided by the cost of bread in this country. Wheat has lately been brought across the North Atlantic, in large quantities in bulk, a voyage of from 3,000 to 3,300 miles (varying according to the loading ports in North America and the discharging ports in the United Kingdom) at a freight rate of 1*s*. 6*d*. per quarter of 480 lbs., which is exactly equivalent to 7*s*. per ton. A weight of 400 lbs. is equivalent to five-sixths of a quarter, and from 400 lbs. of wheat 280 lbs. of flour are made. From this quantity of flour there may be produced between 92 and 94 quartern loaves of bread, or from 184 to 188 2-lb. loaves, which are those generally used in households. On the above basis, 480 lbs. of wheat would yield 336 lbs. of flour, which, in turn, would produce about 112 quartern loaves, or about 224 2-lb. loaves, so that the freight on the wheat represents only 0·09*d*. in the cost of a 2-lb. loaf made from wheat imported from North

America. Sir Frederick Lewis, at the meeting of Messrs. Furness, Withy & Company in August 1923, expressed the facts in another way. He pointed out that wheat was brought from North America to this country at a freight rate of about one-tenth of a farthing per ton per mile, while exports from the United Kingdom to the United States and Canada were carried at the rate of one-seventh of a farthing per ton per mile.

The Long Sea-Haul.

The long-distance trade from Australia and New Zealand to the United Kingdom provides some effective examples of low freights. The rates of freight on frozen produce from Australia and New Zealand are identical, or very similar. Thus the rate on beef is 1*d.* per lb.; on mutton 1¼*d.* per lb.; on lamb 1½*d.* per lb.; and on butter 1*d.* per lb. (5*s.* per box). The rate on cheese from Australia is 1⅛*d.* per lb., and from New Zealand 1$\frac{1}{16}$*d.* per lb., plus 10 per cent., which is equivalent to 8*s.* 4*d.* per ton more than the rate from Australia. The distance from Adelaide to London, *viâ* South Africa, is 12,000 miles, and, *viâ* the Suez Canal, 11,000 miles. The distance between Wellington and London *viâ* the Panama Canal is 12,400 miles, and *viâ* South America 12,200 miles. The rates are too small to allow any appreciable figures to be quoted per ton per mile.

There is, of course, a wide discrepancy between the wholesale prices of imported meat and the retail prices to consumers. For that great margin shipowners cannot possibly be held responsible. The difference tends, indeed, to throw into relief the low cost of actually transporting supplies by sea for many thousands of miles. The shipowners' responsibility ceases when the meat has been discharged in good condition in the great ports of the country, and it is between that stage and the purchase of the meat in the retail shops, or its delivery at the consumers' houses, that the great bulk of the cost to the householder seems to be incurred. Certainly the producers, the freezing companies, and the shipping companies do not get the greater part of the price.

Some particulars of the average prices for South American chilled beef and frozen mutton for some months past may be of interest. The livestock is bought by gross weight, "on the hoof" in Argentina, and the average price for steers for chilling is given as 3·45*d.* per lb., and, for freezing, 2·74*d.* per lb. The average price in Smithfield for chilled hindquarters is 6·24*d.* per lb. and for forequarters, 3·71*d.* per lb. These prices include the cost of chilling in South America, transporting to the London Docks and carriage to Smithfield. The corresponding average price in Smithfield for frozen hindquarters of beef has been 5·96*d.* per lb. and for forequarters 3·39*d.* per lb. Similarly, the average price of frozen mutton has been 6·38*d.* per lb. and of lamb 9·61*d.* per lb. The prices at which the meat is sold in the retail shops vary very greatly, and so consumers may be left to compare the prices which they pay for their joints with the wholesale prices in the London market. The freight represents costs ranging between ¾*d.* and 1*d.* per lb., in the case of beef from South America, plus about $\frac{1}{16}$*d.* per lb. more for chilled meat, to 1*d.*

per lb. for beef from Australia and 1½ per lb. on lamb from New Zealand. It can hardly be maintained that the freight rates have any serious effect on the cost of living, especially when these low charges are compared with the prices at which home-grown meat is sold.

Freight Rates and Selling Prices.

Every commodity would provide striking proof of the low cost of sea transport. As illustrations, the cost of bringing tinned goods—fruit, jams, and meat—from Australia is 80*s.* per ton, which represents less than ½*d.* per lb. Tallow is brought from Australia at the same rate. The freight rate on wool from New Zealand is ⅞*d.* per lb. and on wool from Australia ¼*d.* more. These rates are the equivalent of £11 per ton from Australia and £9 per ton from New Zealand. Allowing, say, 5 lbs. of wool for a man's suit of clothes, the cost of bringing the wool is about 5*d.* This is scarcely a charge which would hinder most people from ordering a new suit. Similarly, freight charges can hardly be a serious factor in the cost of ladies' woollen dresses.

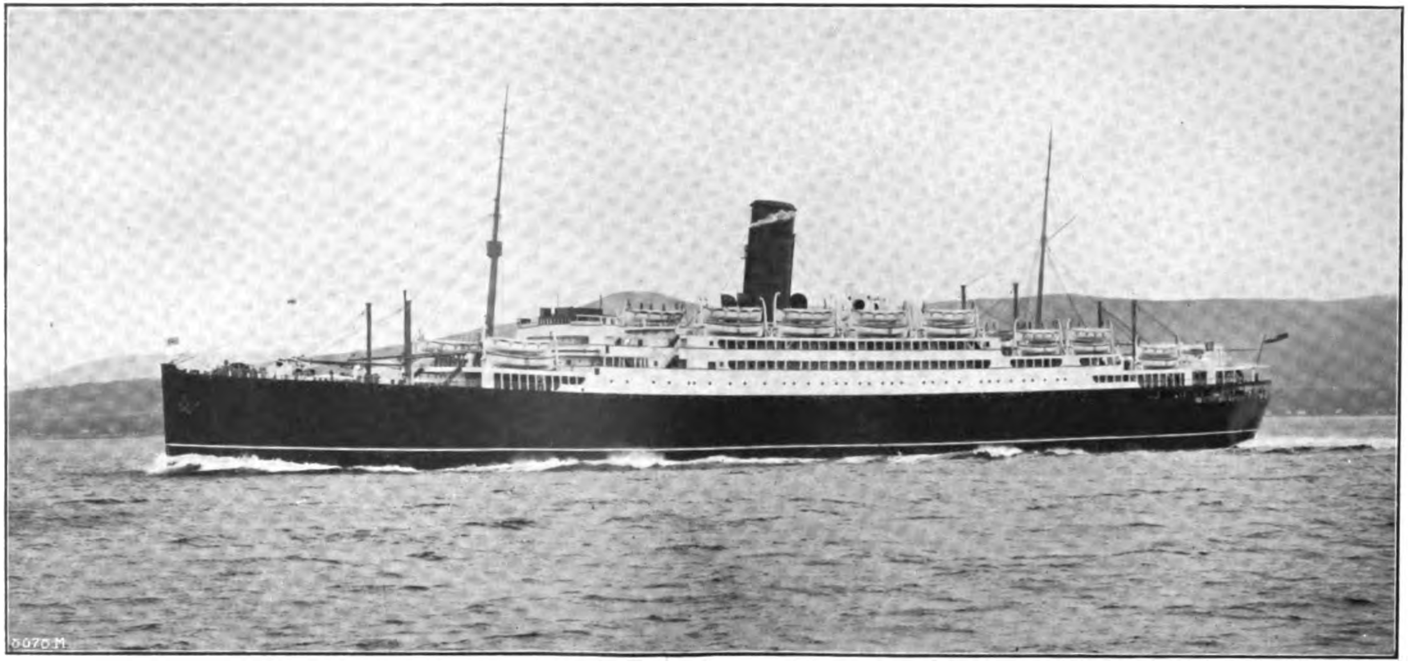
Low freight costs, represented as percentages of selling prices, have always been with us. In 1914, when Russia was exporting large quantities of grain, cargoes were brought from Odessa to London, a distance of 3,200 miles, for a freight of 7*s.* per ton. That rate would represent transport of a ton of grain nearly forty miles for one penny.

The benefit of the low freights on imported foodstuffs was indicated in the report of a Committee of the Royal Society in 1917, which showed that during the five years preceding the war more than 58 per cent. of the energy value contained in the food consumed by the population of the United Kingdom was derived from imported foods. The yearly consumption of cereals was about 5,000,000 tons, of which nearly 4,000,000 tons were imported. Again, of a weekly consumption of 4¼ lbs. of cereals per head of the population, 3⅓ lbs. are imported, and of the weekly consumption of meat of 2⅓ lbs. per head, nearly 1 lb. per head is imported. Expressed in other words, the people in the United Kingdom, as was pointed out at the meeting of the International Navigation Congress in July 1923, eat home-grown bread for only thirteen weeks of the year and bread made from imported grain during the remainder. Home-grown meat is eaten for 32 weeks of the year and imported meat for the remainder. This, however, is not a final analysis, for much of the home production of meat and milk and wheat depends on the importation of feedingstuffs for stock, including the offals from imported grain and on the importation of fertilisers.

Rates of freight on meat are fixed for considerable periods, since the cost of refrigerated tonnage is so great that no company could afford to construct it unless they had some assurance as to its earning capacity. There are refrigerated cargo ships afloat to-day which cost well over £500,000 apiece to build, and their owners declare that no possibility can be seen of their ever being made to pay their way. While they bring partly, or entirely, refrigerated produce homewards, they should normally take out British manufactures. Cargoes have been so scarce outwards that ships have frequently carried very little indeed and, in some cases, none at all. Were space available, examples could be given of the cost of transporting the manufactures of the United Kingdom. The freight, for instance, on a ton measurement of 40 cubic feet of gloves from the United Kingdom to Australia is about 110*s*. Since many hundreds of pairs of gloves would be stowed in that space, the freight on each pair would be minute.

There appear to be, from the shipowners' point of view, no possibilities of improved rates in the early future. The shipping of the world—steel and iron steamships and motor ships—is now greater by some 15,000,000 tons gross than it was before the war, yet the world's commerce, owing to the present inability of Russia and of other countries to trade, is far smaller than it was. Countries which are specially favoured by low working costs have been increasing their mercantile marines, and Germany, which is especially at an advantage in this respect, is gradually rebuilding her merchant fleet and must be expected to be a very serious factor in future competition. It is difficult to discover how any brightening of the freight situation from the shipping point of view could be brought about, but the difficulties of shipowners in future will be the gain of the public in this country.

CUTHBERT MAUGHAN.



(*Photo: Maclure, Macdonald & Co., Glasgow.*)

S.S. CALIFORNIA, ANCHOR LINE (HENDERSON BROTHERS) LTD.

(*Constructed by Messrs. Alex. Stephen & Sons, Linthouse.*)

CHAPTER XII.

THE LIMIT OF FREIGHT DEPRESSION.

To the intense disappointment of shipowners, under-employment and low freights were the portion of the shipping trade in 1923, no less than in 1922. In spite of the promise of its opening days, the year brought no improvement to this much-tried industry. Not only was the early revival not maintained, but the reaction which followed it brought freights down to figures even below the ruinously low level of the previous year. The worst happened, and it is 1923 more than 1922 that will be remembered as the zero year of the great depression which followed the war.

The reason for this disappointment is not far to seek. All the world knows it, for it has been felt in every department of trade and industry, practically throughout the world. It is the European situation. There is no manner of doubt that the year opened with an expanding volume of trade and brightening prospects. For a few months, indeed, international commerce exceeded that of the previous year, as the official returns of our own and several other countries, and the statistics of transit through the Suez and Panama Canals, should witness. But the European demand for grain and foodstuffs, cotton, textiles, metals, iron ore, timber, and raw materials of all kinds, fell away steadily as the year advanced and, therewith, employment for shipping declined.

FOREIGN CURRENCIES AND SURPLUS TONNAGE.

At the same time, depreciated exchanges enabled Continental producers to compete on favourable terms with Great Britain, and the whole tendency was for the European countries with depreciated currencies to trade with each other rather than with Great Britain and the overseas nations whose currencies were appreciating. Thus, the carrying trade, perhaps more than any other, was acutely and directly affected by the economic confusion which resulted from the European developments. Owing to these circumstances, as Sir Frederick Lewis remarked at the annual meeting of Furness, Withy & Co., Ltd., " international trade has dwindled, confidence has disappeared, and with the uncertainty of the future, every one is working from hand to mouth and entering into no more commitments than they are actually compelled to do. Business speculation, or perhaps a better phrase would be business anticipation, practically does not exist, and while these political conditions continue we must reconcile ourselves to the fact that any return of prosperity and confidence is indefinitely postponed."

But there was a secondary cause; that is the further increase in the excess of tonnage afloat. Twelve months before it had been perfectly evident that the supply of world tonnage was far in excess of the requirements of world trade. Naturally, it still remained in excess in 1923, but it may be argued that if international trade had not been ruthlessly checked by the economic disturbance in Europe, ocean-borne commerce would have developed sufficiently, at least, to have absorbed the natural addition to world tonnage which the year brought. Unfortunately, this has not been the case, and the net increase of 795,452 tons, according to Lloyd's Register statistical tables, was, in effect, a superfluous and wholly unnecessary addition to an already large incubus of excess tonnage. Counting sea-going steel and iron steamers and motor vessels only, the increase in the world's tonnage at June 30, 1923, was 15,425,000 tons over 1914. Thus, 1923 was burdened with more surplus shipping than the previous year and there was no more trade to employ it. Falling freights and laid-up vessels were inevitable.

TABLE I.—TONNAGE OF VESSELS ENTERED INTO AND CLEARED FROM BRITISH PORTS.

	Entered (with cargoes).			Cleared (with cargoes).		
	British.	Foreign.	Total.	British.	Foreign.	Total.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Seven months ended July, 1923 . . .	17,503,343	9,913,711	27,417,054	22,696,496	16,526,999	39,223,495
Increase compared with seven months ended July, 1922 . . .	+1,465,195	+1,943,290	+3,408,485	+2,803,441	+4,720,600	+7,524,041
Twelve months ended December, 1922 .	28,421,620	14,904,405	43,326,025	36,815,412	22,864,635	59,680,047
Increase compared with 12 months ended December, 1921. .	+3,297,721	+2,904,970	+6,202,691	+12,533,108	+10,749,498	+23,282,606

No doubt, over all there has been a somewhat larger volume of trade than last year and notably, perhaps, in the case of our own country. The trouble is that it was not maintained, except in the case of coal, and it tended to fall away during the summer months when the Franco-German problem was at its most acute stage. Certainly, the entries and clearances of shipping into and from British ports show a very decided expansion in import and export traffic, and especially the clearances, which have been increased notably by the activity in the coal export trade, as will be seen from the comparison between this year and last given in Table I.

THE DEMAND FOR COAL AND GRAIN.

The importance of coal export expansion in providing increased employment for shipping may be judged from the fact that, during several of the months of the first half of 1923, pre-war shipments were exceeded, while the total export for the half-year amounted to 39,808,881 tons, as compared with 27,183,960 tons in the same half of 1922, and with 35,526,235 tons in that of 1913, or an increase of 12,624,921 tons and over 4,000,000 tons more than in the pre-war period. To arrive at the full effect of coal trade expansion, however, the increase in United States exports must be added. The total shipments of bituminous and anthracite coal from that country for the half-year amounted to 11,542,935 tons, as compared with 5,314,041 tons for the same half of 1922, when the great strike of miners was impending; an increase of 6,228,894 tons. Thus, from the two countries together, there were 18,853,815 more tons of coal to be carried oversea than in the corresponding half of 1922, a tremendously important addition to the employment for shipping.

It is not so easy to estimate the grain which had to be transported overseas, for the reason that so much of it goes to the Continent and can only be ascertained in the trade and navigation returns of a number of countries, but the British imports will, no doubt, serve as an example. Our imports of all classes of cereals and flour during the first half of 1923 amounted to 85,813,849 cwts. as compared with 85,598,245 cwts. for the same half of the preceding year. Thus, in the case of our own country, there was practically no increase, and in view of the known conditions on the Continent, it may be fairly assumed that Europe imported no more, and probably a good deal less, grain than in 1922. Certainly, Germany bought less, and Germany is a big factor in the case, while in France, Belgium, Italy, Holland, and several other countries, purchases were seriously checked by exchange difficulties. Therefore, the demand for grain-carrying tonnage fell very considerably short of the normal.

THE CONTINUED FALL OF FREIGHTS.

Bearing these two facts in mind, let us see how freights actually worked out. Table II., on pages 342 and 343, prepared from the monthly records of *The Compendium*, shows the highest, lowest and mean rates in representative outward and homeward trades for 1921 and 1922, and for the first seven months of 1923.

Taking outward coal freights first, it would, naturally, be supposed that the boom in coal exports which, as shown above, entailed the carrying of 18,853,815 tons more than in the same half of 1922, would have the effect of raising rates considerably. But this was not so in the net result, for, though the highest rates of 1923, in a few cases, exceeded those of 1922, the lowest rates were, with few exceptions, lower than the lowest of last year, so that, speaking generally, the mean rates work out somewhat below the mean of 1922, and this, be it remembered, is in the case of the market which was the most active of all. Cardiff to Alexandria, for example, registered a mean of 12*s.* 6*d.* as compared with 14*s.* 6*d.* in the previous year; Las Palmas of 10*s.* 1½*d.* as compared with 10*s.* 7½*d.*; Gibraltar of 9*s.* as compared with 9*s.* 3*d.*; U.S.A. of 9*s.* 7½*d.* as compared with 11*s.* 8¼*d.*; and Montreal of 8*s.* 4½*d.* as compared with 10*s.* 9*d.* The River Plate,

TABLE II.—HIGHEST, LOWEST, AND MEAN FREIGHT RATES, 1921, 1922, AND 1923.

Ports.	1921			1922.			1923 (to July).		
	Highest rate.	Lowest rate.	Mean.	Highest rate.	Lowest rate.	Mean.	Highest rate.	Lowest rate.	Mean.
COAL FREIGHTS—	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Cardiff to River Plate	22 6	13 6	18 0	19 6	11 6	15 6	20 0	12 0	16 0
„ Alexandria	27 6	14 3	20 10½	17 0	12 0	14 6	14 6	10 6	12 6
„ Las Palmas	13 0	11 0	12 0	12 6	8 9	10 7½	11 9	8 6	10 1½
„ St. Vincent	14 0	11 3	12 7½	12 9	9 3	11 0	12 6	8 9	10 7½
„ Barcelona	21 9	14 0	17 10½	16 0	12 4	14 2	17 6	12 0	14 9
„ Gibraltar	13 6	9 0	11 3	12 0	6 6	9 3	12 0	6 0	9 0
„ Lisbon	16 6	10 7½	13 6¾	13 0	8 9	10 10½	12 6	8 6	10 6
„ Rouen	10 0	5 9	7 10½	8 6	5 0	6 9	9 1½	4 10½	7 0
„ Havre	9 6	5 6	7 6	8 0	4 9	6 4½	8 9	4 6	6 7½
„ U.S.A.	—	—	—	16 0	7 4½	11 8¼	12 0	7 3	9 7½
„ Montreal	—	—	—	14 0	7 6	10 9	10 0	6 9	8 4½
„ Libau	—	—	—	11 0	8 0	9 6	10 0	10 0	10 0
Tyne to Port Said	17 6	12 6	15 0	16 6	11 6	14 0	13 6	13 6	13 6
„ Genoa	22 6	12 3	17 4½	15 6	10 0	12 9	13 6	9 6	11 6
„ Bordeaux	11 0	8 0	9 6	10 0	6 3	8 1½	8 3	5 7½	6 11¼
„ London	8 6	5 0	6 9	7 3	3 7½	5 5¼	7 0	3 6	5 3
„ Gothenburg	13 0	7 9	9 4½	9 3	7 4½	8 3¾	5 6	5 6	5 6
„ U.S.A.	—	—	—	16 0	7 6	11 9	8 6	7 6	8 0
„ Hamburg	—	—	—	6 6	4 9	5 7½	9 6	4 6	7 0
„ Stettin	—	—	—	9 6	5 3	7 4½	9 0	5 4½	7 2¼
AMERICAN COAL FREIGHTS—									
Northern Range to Cont. (coal)	$6.50	$3.50	$5.00	—	—	—	$4.10	$2.00	$3.0½
Do. do. (coke)	—	—	—	—	—	—	$5.50	$4.75	$5.12½
Virginia to Buenos Aires (coal)	$5.75	$3.50	$4.62½	$4.00	$3.25	$3.62½	$4.65	$3.00	$3.82½
„ West Italy (coal)	$6.50	$4.25	$5.37½	$4.50	$4.00	$4.25	$3.75	$2.90	$3.82½

TABLE II. (*continued.*)—HIGHEST, LOWEST AND MEAN FREIGHT RATES, 1921, 1922 AND 1923.

Ports.	1921.			1922.			1923 (to July).		
	Highest rate.	Lowest rate.	Mean.	Highest rate.	Lowest rate.	Mean.	Highest rate.	Lowest rate.	Mean.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
ORE FREIGHTS—									
Bilbao to Middlesbrough	16 0	6 0	11 0	8 3	7 0	7 7½	9 0	7 0	8 0
,, Tyne	13 0	7 9	10 4½	7 0	6 9	6 10½	8 3	7 9	8 0
Bordeaux to Bristol Channel	12 6	8 0	10 3	11 6	6 4	8 11	11 3	9 0	10 1½
Huelva to Northern States	10 6	9 3	9 10½	12 6	10 6	11 6	11 6	11 6	11 6
HOMEWARD FREIGHTS—									
Karachi to U.K./Cont.	42 6	20 0	31 3	28 0	18 0	23 0	32 6	22 6	27 6
Rice Ports do.	65 0	32 6	48 9	25 0	22 6	23 9	38 0	27 6	32 9
Bombay, d.w., do.	50 0	20 0	35 0	27 6	17 0	22 3	32 6	25 0	28 9
Java (sugar) do.	72 6	30 0	51 6	35 0	30 0	32 6	37 6	32 9	35 1½
Alexandria to London or Hull (per 60 c.f.)	22 6	10 0	16 3	12 6	9 0	10 9	11 0	11 0	11 0
River Plate (Lower Ports) to U.K./Cont.	60 0	16 6	38 3	40 0	16 0	28 0	27 6	19 0	23 3
,, ,, (San Lorenzo) do.	57 6	17 0	37 3	37 6	19 0	28 3	36 3	19 0	27 7½
Northern Range to U.K. (grain, per qr.)	6 9	3 3	5 0	5 3	2 0	3 7½	3 9	2 6	3 1½
Montreal to U.K./Cont. (grain, per qr.)	6 6	4 0	5 3	4 9	3 0	3 10½	4 9	2 7½	3 8¼
Gulf Ports to U.K./Cont. (grain, per 100 lbs.)	9 6 per qr.	4 10½ per qr.	7 2¼ per qr.	21c.	13c.	17c.	18½c.	14c.	16¼c.
Black Sea to Cont.	—	—	—	—	—	—	15 6	15 0	15 3
Danube to U.K. (grain)	40 0	16 9	28 4½	22 6	16 0	19 3	23 0	15 6	19 3
Australia to U.K. (grain)	82 6	45 6	64 0	52 6	35 0	43 9	45 0	30 0	37 6
Nitrate Ports to U.K./Cont.	65 0	30 0	47 6	44 9	25 0	34 10½	37 6	27 6	32 6
,, ,, U.S.A.	$5.00	$4.00	$4.50	$6.00	$4.00	$5.00	$6.00	$4.00	$5.00
Sundsvall to East Coast	105 0	70 0	87 6	67 6	42 6	55 0	48 0	40 0	44 0
TIME CHARTERS—									
General trade (12 months)	8 6	5 0	6 9	5 0	4 0	4 6	4 3	3 9	4 0

it is true, shows a mean of 16*s.* as compared with 15*s.* 6d. a year previously, but that is due to the heavy fall in homeward grain freights, which, at times, were responsible for forcing up outward coal freights to that destination. From the Tyne ports, the fall was rather more pronounced than at Cardiff, the mean rate for Genoa being down to 11*s.* 6*d.* as compared with 12*s.* 9*d.*; for Bordeaux 6*s.* 4¼*d.* as compared with 8*s.* 1½*d.*; for Gothenburg 5*s.* 6*d.* as compared with 8*s.* 3¾*d.*; and for U.S.A. 8*s.* as compared with 11*s.* 9*d.* Only in the case of one German port was the mean higher in 1923, that for Hamburg being 7*s.* as compared with 5*s.* 7½*d.*, a fact which is easily accounted for by the pressure for tonnage to load for that destination. Thus it is seen that even coal freights come badly out of the comparison with the previous year.

In coal, as already indicated, there was a recrudescence of American competition, and coal freights from Hampton Roads, etc., to European ports, the Mediterranean, and to South America were more than usually in evidence. In the preceding year, of course, owing to the great strike of miners in the United States, very little coal was sent to Europe, apart from contract shipments to Italy, and not much to South America, but in 1923 shipments went forward more or less steadily in all these directions, and they, exceptionally, included a good deal of coke. Nevertheless, these freights declined sharply as the year advanced, until very low figures were reached in the autumn, such, for example, as 2·00 dols. to the North Sea Continental ports, 2·90 dols. to West Italy, 3·00 dols. to the River Plate, and 3·70 dols. to Brazil, while coke has been down to 4·75 dols. to the Continent.

DIGEST OF THE HOMEWARD MARKETS.

Turning now to the homeward markets, what has been said about grain explains and emphasises the fall which occurred in the Montreal, North American, and River Plate markets. The Montreal rate fell as low as 2*s.* 7½*d.* per quarter (and even 2*s.* 4½*d.* by liners) to the U.K., bringing the mean down to 3*s.* 6¾*d.* as compared with 3*s.* 10½*d.* in 1922. Similarly, from the Northern Range, the rate was down to 2*s.* 6*d.* per quarter, which, however, is not so low as the lowest rate of 2*s.* recorded for the preceding year, though the mean of 3*s.* 1½*d.* is lower by 6*d.* than that of twelve months before. No doubt, the demand for coal-carrying tonnage had the effect of keeping the grain rate from collapsing to the lowest point of 1922. The River Plate market, bad as it was, did not touch the lowest figure of 16*s.* reached last year (though berth boats were probably accepted down to this rate); but, on the other hand, the highest rate, 36*s.* 6*d.*, fell short of the 37*s.* 6*d.* returned for 1922. The net result is a mean of 27*s.* 7½*d.* as against 28*s.* 3*d.* The Australian market fell heavily from a highest rate of 45*s.* to a lowest of 30*s.*, giving a mean of 37*s.* 6*d.*, which compares with 43*s.* 9*d.* for the previous year. The Danube market showed a little life at from 23*s.* down to 15*s.* 6*d.*, giving a mean of 19*s.* 3*d.*, which is the same as in the preceding year. An interesting development in this quarter was the decision of the Russian Soviet Government to export some 5,000,000 tons of grain (though a year before the famine made it necessary to ship relief cargoes of wheat from the United States), and in August chartering from the Black Sea was resumed after a long spell of post-war stagnation, business being done on the basis of 15*s.* to 15*s.* 6*d.* for heavy grain to the Continent. If the Black Sea market should continue to be a constant factor, there can be no doubt of its importance to shipowners, who will be able to restore the traditional route, *i.e.* coal out to the Mediterranean and grain back from the Black Sea. Another grain market which opened out during the year was that from South Africa, from which quarter a good deal of maize was shipped to Europe at rates ranging from 27*s.* 6*d.* to 24*s.* It is a remarkable fact that while the purchasing power of Europe was greatly restricted, there has seldom been so much grain offering for shipment as in 1923. Nearly everywhere the harvests were good, and Canada, the United States, Argentina, South Africa, Australia, India, and South Russia vied with each other in offering cereals to Europe. Had the economic conditions in Europe been more propitious, there must have been unusual activity in grain freights and therewith much better freights for shipping. That is the irony of the situation.

The Eastern markets, not, of course, including Australia, constituted an interesting exception to the general rule, for rates rose appreciably as compared with 1922. The mean for Karachi works out to 27*s.* 6*d.* as compared with 23*s.* for 1922; that for the Rice Ports to 32*s.* 9*d.* compared with 23*s.* 9*d.*; that for Bombay (on d.w.) at 28*s.* 9*d.* compared with 22*s.* 6*d.*; and that for sugar from Java at 35*s.* 1½*d.* compared with 32*s.* 6*d.* In 1922, however, freights were exceptionally low in the Eastern trades, being worse than in any other market, and, in 1923, the East was less affected by the slump in the European exchanges than most other quarters of the globe; the early improvement in freights therefore was not wholly lost.

Nitrate freights from Chile were an improving, if narrow, market, which developed a slowly gathering activity and offered fairly good prospects for the winter. Rates, however, did not rise, the mean being 32*s.* 6*d.* as compared with 34*s.* 10½*d.*, though the lowest rate in 1923 was 2*s.* 6*d.* higher than in 1922. At times this market suffered from diversions of tonnage from the River Plate, where steamers unable to obtain charters were ordered round to Chile to pick up such nitrate charters as were available.

The North Pacific trade with the Eastern States and Europe *viâ* the Panama Canal, developed on the right lines, if slowly, and tended to take up more tonnage for the carriage of grain and produce to Europe.

Some improvement in our iron and steel trades, inadequate though it was, led to an increased demand for iron ore, and ore freights from the Mediterranean and Bay ports to this country, on the whole, found employment for more tonnage and at better rates of freight, the mean from Bilbao to Middlesbrough being 8*s.*, as against 7*s.* 7½*d.* in 1922; to the Tyne 8*s.*, as against 6*s.* 10½*d.*; and from Bordeaux to the Bristol Channel 10*s.* 1½*d*, as against 8*s.* 11*d.* Germany, normally a large consumer of iron ore, had, however, the greatest difficulty in purchasing her requirements owing to the wholesale collapse in her exchange, and the failure in the German demand greatly curtailed shipments to Rotterdam and Hamburg, thus depriving the market of an important section of its customary trade. The United States did not draw heavily on the Mediterranean for supplies of ore, and the freight from Huelva to Philadelphia, and Baltimore did not prove very attractive to owners.

Tanker freights were one of the few bright spots in the market. Owing to the disappointing output of oil in Mexico, there was a rapid development in the production of the Californian oilfields and the shifting of the American demand to that quarter led to unusual activity in the trade between the Pacific Coast and the Eastern States *viâ* the Panama Canal. Of course, it was American tonnage that reaped the advantage of the rise in freights which followed, since only American ships can engage in the coastwise trade, but there was some business done for Europe, and absorption of so much tonnage for the United States trade, naturally, had a reflex action on tanker freights at large. Towards the autumn of 1923, especially, after the fall in the price of crude oil, an improving inquiry developed for handy vessels from the Gulf to European ports, 40*s.* to 42*s.* 6*d.* being offered for September shipment to the Mediterranean.

Time-charter business, always regarded as the surest index of the state of the shipping trade, was extraordinarily dull, and rates fell to the lowest figures, down to 3*s.* 9*d.* being done for 12 months in the general trade, while the mean for the first seven months of the year 1923 was no better than 4*s.* as against 4*s.* 6*d.* in the preceding year.

GEOMETRICAL FREIGHT AVERAGES.

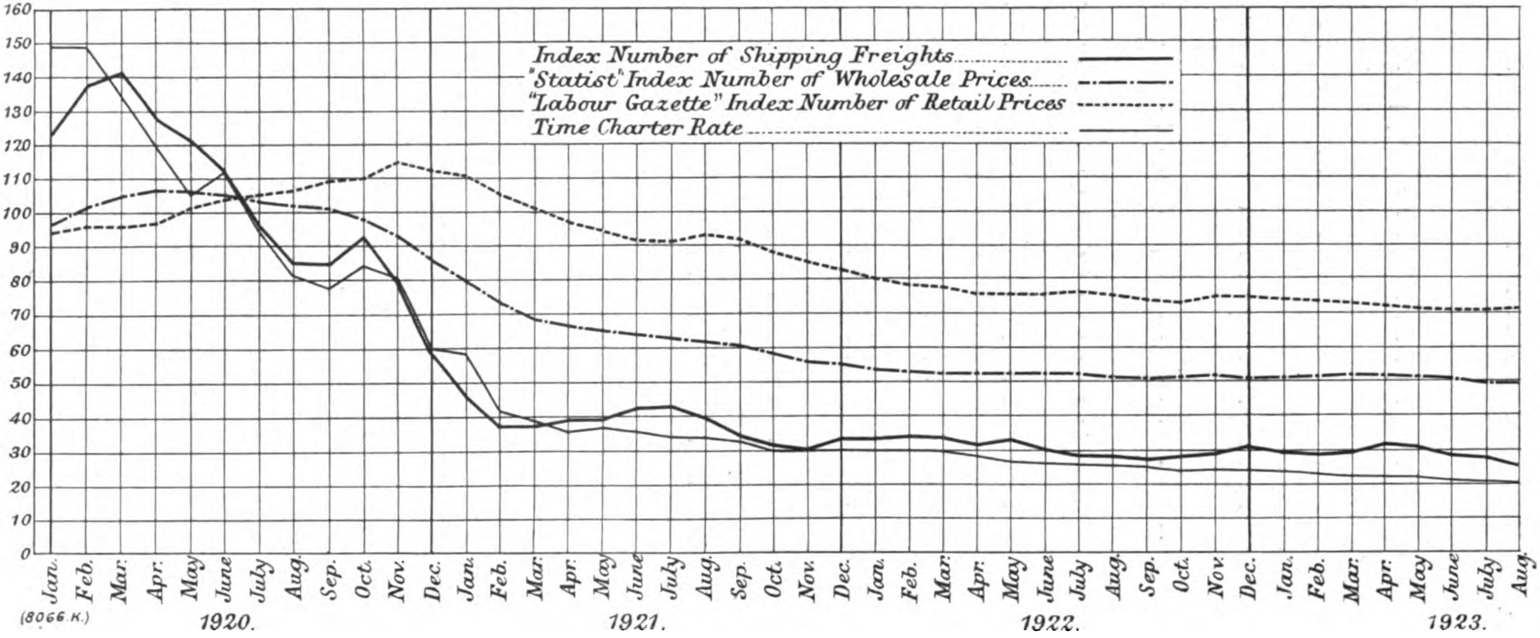
The geometrical freight averages prepared by the Chamber of Shipping (see Table III. on page 347, and the diagram on page 348), naturally, corroborate the conclusions drawn from the highest and lowest and mean freights; the table has the advantage of showing the course of freights from month to month. It will be seen that, the Eastern markets excepted, the general tendency was for the averages to fall below the average for 1922, and that, in the summer months of 1923, the fall became very marked. Almost invariably, again excepting the Eastern markets, the averages for May, June, and July, but certainly for June and July, were substantially below the 1922 average, which in turn, without an exception, was below, and much below, the average for 1921. Thus, in July, the average in the European trades was only 31·46 per cent., as compared with 34·05 per cent. for all 1922; in the Argentine and Uruguay trades 23·16 per cent., as compared with 27·13 per cent.; in the Australian trade 23·18 per cent., as compared with 31·36 per cent.; while in the case of the Red Sea, Arabian, and Indian trades, it was higher, viz., 27·69 per cent., as compared with 24·85 per cent., and also in the case of the United States trade at 28·60 per cent., as compared with 27·84, though in this trade the average was down to 24·12 per cent. in May. The average over all trades in July was 27·61 per cent., as compared with 29·73 per cent. for 1922. Generally speaking,

TABLE III.—CHAMBER OF SHIPPING GEOMETRICAL FREIGHT AVERAGES.

Route.	Freight per Ton, Geometrical Average.*									
	1921.	1922.	1923. Jan.	1923. Feb.	1923. March.	1923. April.	1923. May.	1923. June.	1923. July.	1923. Aug.
1. Alexandria to U.K.	37·74	29·89	30·18	27·17	27·87	28·56	34·83	—	—	28·92
2. Bilbao to Cardiff	50·72	43·85	44·92	45·31	47·81	43·36	43·23	41·24	40·62	—
3. Cardiff to St. Vincent	39·56	35·35	29·61	29·01	37·46	35·05	33·70	32·23	31·42	30·32
4. Cardiff to Port Said	35·59	31·15	26·27	27·14	30·28	26·78	24·81	24·15	24·09	22·72
5. Pit Props, Baltic to U.K.	36·69	34·09	—	—	—	—	—	30·66	30·30	30·30
6. Bilbao to Middlesbrough	34·83	31·48	29·40	33·35	34·87	33·35	31·63	—	29·40	28·30
7. Bilbao to Bristol Channel	42·62	37·40	37·32	37·95	40·48	38·58	36·68	36·05	35·42	35·42
8. Hornillo Bay to U.K.	36·68	30·88	29·48	29·48	29·99	31·01	28·98	—	—	—
European Waters	38·59	34·05	32·04	32·23	34·97	33·40	32·97	32·36	31·46	29·08
9. Karachi to U.K./Cont.	28·84	25·43	27·98	—	29·41	32·55	29·98	28·84	25·69	24·84
10. Rice Ports to U.K./Cont.	37·58	25·10	28·88	23·86	27·73	31·81	27·20	—	29·29	20·93
11. Bombay to U.K.	30·22	24·02	30·19	—	30·19	33·54	32·99	30·33	28·23	25·16
Red Sea, Arabia and India	31·48	24·85	29·00	23·86	29·09	32·63	29·96	29·58	27·69	23·56
12. Java to U.K./Cont.	37·04	25·66	28·21	27·10	27·80	29·22	—	27·80	—	—
13. Australia to U.K.	43·30	31·36	31·65	26·75	27·64	—	24·07	22·74	23·18	22·74
14. River Plate (Lower Ports) to U.K./Cont.	31·56	25·26	24·64	—	20·01	26·02	25·78	23·51	22·27	18·51
15. San Lorenzo to U.K./Cont.	41·14	29·13	26·27	25·18	23·56	31·28	31·68	27·21	24·09	21·67
Argentina, Uruguay, etc.	36·85	27·13	25·15	25·18	21·71	28·53	28·58	25·29	23·16	20·03
16. Brazil, Bahia Blanca to U.K.	35·96	29·08	27·19	26·91	25·21	28·89	31·16	26·91	22·66	20·11
17. Northern Range to French Atlantic	34·10	20·00	—	—	25·31	—	—	—	—	—
18. Northern Range to West Italy	30·17	24·74	24·79	21·49	25·46	29·15	24·12	21·44	—	—
19. Gulf Ports (grain) to U.K./Cont.	57·10	31·74	26·81	—	—	—	—	30·39	28·60	27·71
20. Gulf Ports (timber) to U.K./Cont.	40·35	33·73	31·62	31·31	28·52	—	—	27·28	—	29·14
United States	37·30	27·84	27·60	25·94	26·39	29·15	24·12	26·10	28·60	28·42
21. Canada to U.K. (grain)	50·94	34·75	—	—	—	41·75	38·36	34·98	24·82	20·31
Geometrical Average of all Routes	**37·59**	**29·73**	**29·42**	**28·91**	**29·37**	**32·22**	**30·77**	**28·68**	**27·61**	**25·03**
Time-Charter Rate	36·34	26·59	24·09	23·90	23·75	23·90	23·53	21·81	20·92	20·17
Statist Wholesale Prices	61·7	52·6	51·9	52·5	52·9	53·4	52·7	51·0	49·7	49·8
Labour Gazette Retail Prices	94·02	76·22	74·33	73·91	73·49	72·60	70·99	70·57	70·57	71·40

* The geometrical average for 1920 for the corresponding route or routes is taken as 100.

INDEX NUMBER OF SHIPPING FREIGHTS.
COMPILED BY THE STATISTICAL DEPARTMENT OF THE CHAMBER OF SHIPPING OF THE UNITED KINGDOM.



there was a rise in the averages for March and April, which was not maintained in May, and in June and July almost invariably fell to the lowest figures of the year, indeed to the lowest figures of the entire post-war depression, from which they did not recover in August.

Freight Declension and Laid-up Tonnage.

And here it is instructive to see how these variations in freights affected the amount of idle tonnage in our ports. From Table IV. it will be seen that the year 1923 opened relatively well (as compared with 1922), with 709,224 net tons of shipping laid up in British and Irish ports. With the improvement in freights which distinguished the first quarter, the idle shipping fell to 546,555 tons by April 1, or little more than a third of the tonnage recorded for the worst period of 1922 and the lowest since the depression commenced. But, unfortunately, this evidence of better times proved to be evanescent, for with the reaction in homeward freights which followed in May, June, and July, the shipping tied up at the mooring buoys increased to 709,102 tons, or by 30 per cent., and very nearly equalled the quantity recorded at the beginning of the year. Thus, the improvement of the spring was entirely lost in the summer, and the freight outlook is so bad that it is futile to hope for any early reduction in the tonnage of laid-up shipping.

Table IV.—Vessels laid up in British and Irish Ports.

Date.	Vessels.	Net tonnage.
July 1, 1921	723	1,852,412
January 1, 1922	712	1,307,593
April 1, 1922	484	836,619
July 1, 1922	582	1,112,332
October 1, 1922	456	824,624
January 1, 1923	411	709,224
April 1, 1923	321	546,555
July 1, 1923	372	709,102

Taking the geometrical average over all routes for each month as the simplest index of freights and comparing it with the laid-up tonnage, produces the result given in Table V.

Table V.—Geometrical Freight Averages and Tonnage Laid up.

	Geometrical average.	Tonnage laid up.
For all 1922	29·73	709,224 net tons
January, 1923	29·42	
February ,,	28·91	
March ,,	29·37	
April ,,	32·22	546,555 ,,
May ,,	30·77	
June ,,	28·68	
July ,,	27·61	709,102 ,,

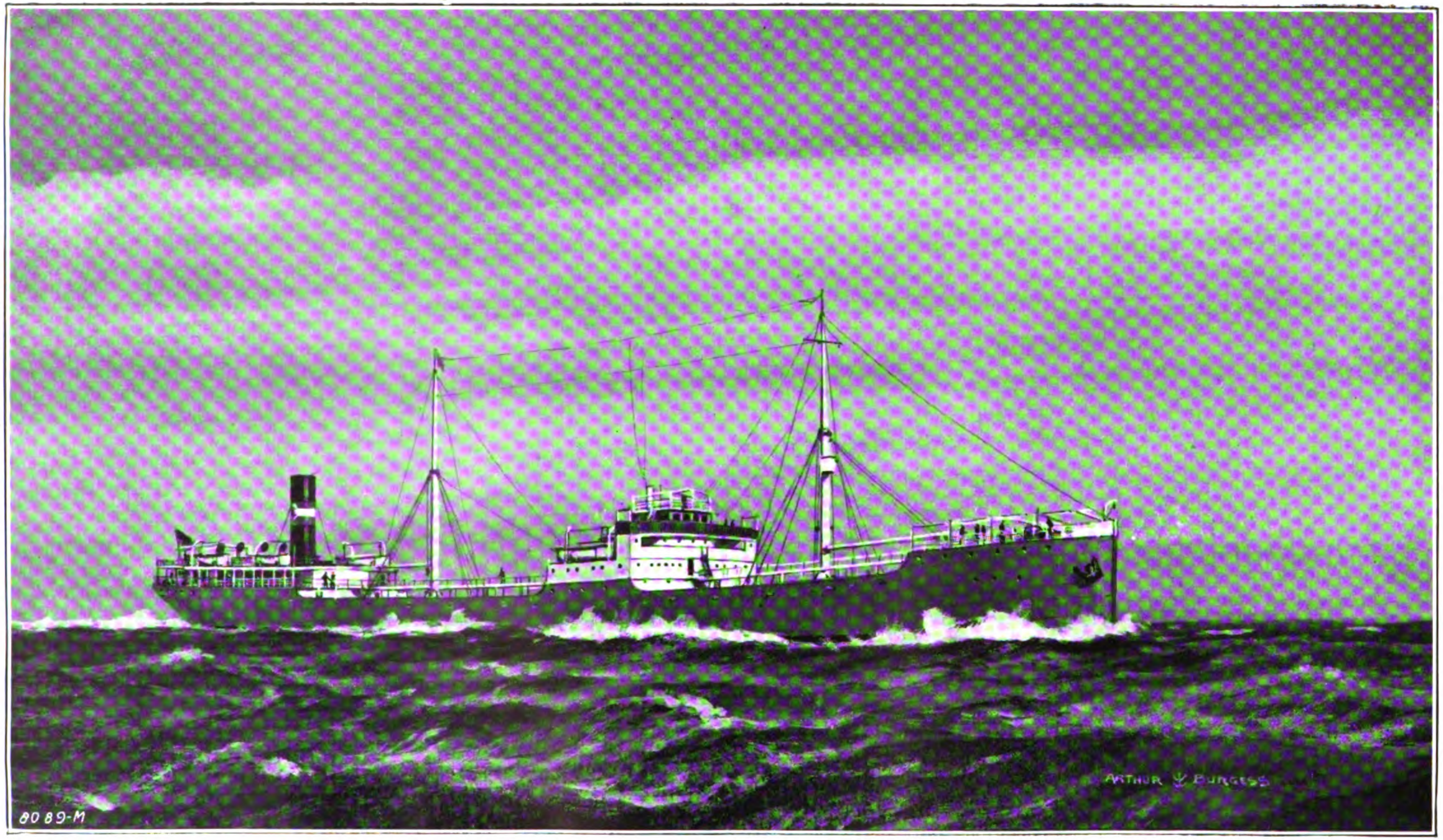
Working Costs.

While rates of freight thus worked out so disastrously for shipowners, there was some little compensation in reduced working costs as compared with 1922. Indeed, all that owners could do to mitigate their losses was to concentrate on reducing their running costs and, by dint of agitation here and pressure there, they succeeded in getting down wages, stores, dock and port charges and repairs to a lower level. In addition, there is some prospect of their being freed from multiple income taxation, now that the British Government has accepted the offer of the United States for mutual exemption, and quite possibly some other maritime States will follow suit. Unfortunately, however, much of the advantage which might have accrued from these reductions was counteracted by the rise in the price of bunker coal, which, alike at home and abroad, went up to figures that have proved really oppressive to owners who were struggling against adversity. Fuel oil prices, happily, did not follow coal up, but kept tolerably even at from £3 to £3 10*s.* a ton for heavy oil and from £4 te £4 5*s.* for Diesel-engine oil, so that oil-burning vessels and motor-ships did relatively better than coal-burning steamers, a circumstance which could hardly fail to assist the process of converting steamers to burn oil and, in the case of new tonnage, to stimulate the building of motor ships.

A CHEERLESS OUTLOOK.

Twelve months ago it was remarked, in this connection, that "opinion is growing that some measure of trade revival cannot be long delayed. . . . On the other hand, there can be no world improvement until the vexed questions of German reparations and Allied war debts have been definitely settled and the exchanges stabilised." To-day, twelve months after, we see that German reparations and Allied war debts are still unsettled and trade is worse than ever. Except for our arrangement to repay our war debt to the United States, little progress has been made in this direction. Literally, everything now depends upon the financial recovery of Germany and the economic stability of Europe. If the result of British intervention should be a mutual arrangement for fixing the sum and dates for the payment of German reparations, gradual trade recovery may be anticipated, though it may be slow. In such an event, 1924 should see a forward move in international commerce, and therewith fuller employment for shipping and better rates of freight. All that shipping needs to restore its vitality is work to do. Shipping is very sensitive and very mobile. Once the exchange of commodities between nations begins to increase, shipping will soon respond. Improvement in freights, therefore, depends almost solely on European trade recovery.

R. W. JOHNSON.



(*From a drawing by Arthur J. W. Burgess.*)

MOTOR TANKER WITH CAMMELLAIRD-FULLAGAR OIL ENGINES.

(*Under construction by Messrs Palmer's Shipbuilding and Iron Co., Ltd., Jarrow-on-Tyne.*)

CHAPTER XIII.

SHIPPING AND POLICY.

IT has long been proverbial that the British people know little and care little about the shipping on which the majority of them depend, literally, for their daily bread. The war, however, brought shipping prominently before the public, and recent events have served to sustain the interest then aroused. There is to-day more public discussion of maritime affairs than at any period since the early days of steam.

This being so, it is of the first importance that we should form clear ideas both as to shipping policy and as to the relation between shipping problems and national policy as a whole. British shipowners, as a class, are not in the habit of looking to the State for assistance, and experience has made them distrustful of State interference.

On the other hand, the whole trend is towards extending the scope of Governmental activities, and unless the growing interest in maritime affairs is accompanied by an increasing appreciation of the character and functions of the industry, there is a grave danger that, where the State cannot help, it will hinder. A new-found zeal, not according to knowledge, may be more dangerous than indifference.

We saw this in the war, when attention was so long diverted, by arbitrary schemes of freight regulation, from the real problem of a deficiency in carrying-power, due to losses, declining output, port congestion, and wasteful employment of requisitioned tonnage. It was the lack of adequate knowledge as to the extent, character, and functions of our mercantile marine that first allowed the problem to arise, and subsequently delayed the application of the right remedies. In the absence of a clearly defined policy, based on accurate knowledge, we shall always be at the mercy of empirical experiment.

Moreover, the reactions of shipping on policy are at least as important as the reactions of policy on shipping. More than any other industry, shipping brings nations into contact. It is the ships that make possible that ever-widening stream of intercourse which should be the surest guarantee of the peace of the world. At the same time, and as a necessary corollary, the problems of shipping—navigational restrictions, flag discrimination, jurisdiction in territorial waters—are particularly fertile in occasions of international friction.

SHIPPING AN INTERNATIONAL BUSINESS.

It is, indeed, the fundamental fact, in the light of which every question of domestic as well as of external policy must be considered, that shipping is an international business. Ships are common carriers for all nations. All nations are served by ships under many flags.

There is, in practice, a strange reluctance among both peoples and Governments to accept the bi-lateral character of foreign trade. Throughout almost all the arguments by which the American Ship Subsidy Bill was supported, ran the tacit assumption that both American imports and American exports were an exclusively American concern—were, in fact, as purely a matter of domestic interest as the sale of goods by a merchant in Pittsburg to a consumer in Cincinnati. Where foreign trade is concerned, it seems almost impossible to induce people to realise that to every commercial transaction there must be at least two parties—a buyer and a seller—and that the voyage which renders the transaction possible is a matter in which buyer and seller are equally interested. Both for buyer and seller—and every nation is buyer and seller not merely in turn but simultaneously—the supreme necessity is that the supply of shipping should be plentiful, regular, and cheap.

It follows from this international character of the industry that a purely nationalist shipping policy must inevitably tend both to create international friction and to check the development of trade, and therefore, in the long run, the demand for shipping. By a nationalist policy is meant one which aims at fostering artificially the growth of the mercantile marine, by the grant of exclusive privileges or by imposing disabilities on foreign shipping. Such a policy may be pursued in any one of three ways: by the reservation of certain trades to vessels under the national flag; by differential treatment of foreign vessels or their cargoes, in such matters as port dues and taxation; or by the payment of direct subsidies.

Before dealing with the effect of such policies, a word may be said with regard to the ends for which they are usually proposed. These may be roughly classified as the encouragement of trade, and national defence.

THE ARGUMENTS FOR STATE SUPPORT.

The former argument was put forward by President Harding in his address to Congress on the Ship Subsidy Bill, when he said that long-continued eminence in the export trade depended on the development of the national mercantile marine, and that American shipping must be subsidised in order that American exporters might be sure of selling. This is, quite simply, nonsense. Shipowners live by fulfilling the demands of commerce, and a country which produces goods needed by the world will always be sure of ships to carry them. So long as the world needs American wheat and cotton, the ships of every nation will flock to her ports and compete for the privilege of carrying her exports at the cheapest world-rate, to the advantage of both the producer and the consumer. So long as

Great Britain needs to maintain her vast industrial population by oversea supplies, the lure of freights will bring ships from the four corners of the world with foodstuffs and raw materials. What proportion of these ships is under the national flag will depend, in either case, on national aptitudes and economic conditions. The great bulk of America's huge exports has been carried in foreign, mainly in British, bottoms, because the conditions made it more profitable for Americans to employ their capital, labour, and enterprise in other directions, and to take payment in services, rather than in goods, for a large proportion of their exports to Great Britain. On the other hand, the geographical position and natural resources of Great Britain have naturally predisposed her people to maritime enterprise, and the eagerness of foreign countries to sell her goods in excess of their requirements for her products, has ensured the direction of capital and labour to the production of that surplus tonnage the services of which play so large a part in balancing the account.

It is often argued, however, that an attempt to foster the national mercantile marine beyond the level of economic demand, and even at an economic sacrifice, may be justified by considerations of national defence. Not only does war create a demand for ships as transports and naval auxiliaries, but the supply of essential commodities in war time will be more secure if sufficient tonnage be available under the national flag. Those who argue thus are apt to overlook the enormously important part played by neutral shipping in every great naval war of the past; but to a country like Great Britain, dependent on seaborne trade for the necessaries of life, a great mercantile marine is unquestionably a source of strength in time of war. It does not follow that the provision of artificial stimulus is either necessary or conducive to its development.

In this connection it is important to remember that, for Great Britain, it is not sufficient to maintain just so much tonnage as can find permanent employment in trade to and from the United Kingdom. To meet either the seasonal demands of peace or the emergencies of war, it is necessary to draw on the world pool of shipping, and if this floating reserve is to be kept under the British flag, it must be able to find alternative employment in the general carrying trade of the world. Thus any measure which, in seeking to foster British shipping, tends to restrict the freedom of international intercourse, or, by provoking retaliation, to restrict the range of employment open to British ships, will defeat its own ends.

FAILURE OF NAVIGATION ACTS.

This is the answer to the demand, frequently made during and since the war, for a revival in some form of the old Navigation Acts. By these Acts the carriage of all imports into and exports from the Colonies was reserved exclusively to British shipping, and imports into Great Britain from Europe were admitted only in British ships, or ships belonging to the country of origin. The whole system rested on the Colonial monopoly, which made Great Britain the sole source of supply for most Colonial needs, and the sole entrepôt for the chief colonial products. The revolt of the American Colonies made the first great breach in the system; its final overthrow came in the early nineteenth century. The industrial revolution had led to an immense expansion in British commerce, and British shipping, keeping pace with its development, had attained predominance in the general carrying trade. The foreign trade was now too important to be sacrificed to the colonial; the colonial trade no longer sufficed to absorb the surplus tonnage. Hence Great Britain had become acutely sensitive to the threat of retaliation. By a series of reciprocity treaties with various foreign Powers, and by concessions granted to British and Colonial merchants, anxious only for an assured supply of ready tonnage at reasonable rates, the system was gradually broken down, and long before the final repeal of the Navigation Acts in 1849, they had ceased to be effective as a protective measure, while they still fettered, to some extent, the free development of trade.

There can hardly be any question to-day of excluding foreign shipping from any part of the direct trade between foreign countries and the Empire. The usual proposal is for reservation of the inter-Imperial trade. Now, the inter-Imperial trade constituted, just before the war, less than 16 per cent. of the traffic carried by shipping under the British flag, and over nine-tenths of the inter-Imperial trade was already carried in British bottoms. On the other hand, over 46 per cent. of the traffic under the British flag was carried between ports wholly outside the Empire.* Of all Powers, Great Britain has the least to gain and the most to lose by embarking on a policy of restriction and retaliation.

The whole principle of reserved trades is economically unsound. Such an extreme form of protection tends, almost inevitably, to inefficiency. Prior to the repeal of the Navigation Acts, British shipping was at its lowest ebb in efficiency and character, and was fast losing ground in every trade where it was exposed to competition. The repeal of the Acts was followed almost immediately by a remarkable increase in vigour and expansion in tonnage.† Further, the principle is incompatible with the economic employment of shipping, since it tends to rule out the cross-voyages that play so large a part in the avoidance of ballast passages and the reduction of working costs. Carried to its logical conclusion in foreign commerce, it would result in every ship sailing empty on one way of the round voyage. It hampers the development of trade by raising the cost of transport and restricting the shipper's choice of prompt tonnage. At every turn, it interferes with the natural flow of trade. Producers suffer from loss of markets; consumers from restriction of supplies and increase in cost.

At least equally serious are its political disadvantages. Applied by any Power prominent in shipping and commerce, it inevitably provokes retaliation. The history of the Navigation Laws imposed by ourselves and by other countries, is one of incessant friction, retaliatory measures and counter-measures, unstable compromises, and diplomatic squabbles. More than once, navigational restrictions have played a part in provoking war itself. On both the economic and political counts, the Committee on Shipping after the War were surely right when they said that, at a time when the supreme need of the world was, first for peace, and then for restoration of economic life, "it would be deplorable to set out on a course which would hamper the natural flow of trade and lead to endless quarrels among the maritime nations of the world."

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* Report of the Committee on Shipping after the War. Cd. 9092, p. 145.

† See Hurd, "The Merchant Navy," vol. I. pp. 72–83, and Lindsay, "History of Merchant Shipping," *passim*.

Flag Discrimination.

Much the same objections apply to all the various forms of flag discrimination—differential dues, differential treatment of foreign vessels as regards port facilities, interference with the right of transit, as practised by Germany through the Control Stations, interference with the right of an immigrant to choose his ship as proposed in the United States, preferential railway rates for goods exported in national vessels, remission of taxes in respect of imports or exports under the national flag, preferential treatment of national ships passing from one sea to another through waterways territorially controlled. All such measures are provocative of retaliation and diplomatic friction; all tend, both in themselves and by the retaliation they provoke, to hamper the natural flow of trade, and thus to restrict its expansion. All alike are distinguishable from other forms of protection by their implied assertion of national ownership over an essentially international traffic.

By far the least objectionable method of fostering a mercantile marine is the payment of direct subsidies. This method at least involves no direct interference with the shipper's right of choice, and subsidy can, if necessary, be met by subsidy, without the friction associated with a competition in penal legislation. The wisdom of subsidies is another matter. For many years the French mercantile marine stood still, while France was paying in subsidies and bounties more than any other power. Some highly subsidised lines, like the Austrian Lloyd, have been financially unsuccessful and a by-word for inefficiency. Others, like the great Japanese lines, have in many years made large profits, provided in part by the taxpayer. As a general rule, the lines that have profited most from the subsidies have been those that could have done without them.

The great danger of this, as of all other forms of artificial stimulus, is that of unnatural development and consequent instability. The lines on which the American War Emergency Programme was run, and the reluctance of the Government to scrap it when the emergency was past, have saddled the United States with a vast mercantile marine having no vitality because it has no economic *raison d'être*. It has been created not in response to the demands of commerce, but as the result first of war requirements, and later, of political pressure. This great body of tonnage, for the larger part of the services of which there is no demand, is to-day a disturbing factor both in American politics and in the trade of the world. It can be run by shipowners only on the basis of subsidies which even the Americans are unwilling to pay. It can be run by the Shipping Board only at a heavy loss, made good by appropriations amounting to a veiled subsidy. In such circumstances the temptation to resort to methods of unfair and uneconomic competition is almost irresistible, and it is not surprising that the Subsidy Bill, thrown out with such difficulty, contained measures of flag discrimination that must have done incalculable harm to the trade of America and of the world. It would not be fair to quote the Emergency Fleet as a product of subsidisation; but its later developments and present position illustrate, in no uncertain manner, the dangers inherent in artificially stimulated production and in the control of economic operations for political ends.

STATE OWNERSHIP AND WAR.

It is worth noting that every possibility of international friction arising from shipping affairs would be greatly increased if there were any wide extension of the principle of State ownership. It is obviously unfair that a State-owned ship, trading for profit, should claim the immunities and privileges of a public vessel, and it may be hoped that the efforts of the International Maritime Committee to procure a removal of this anomaly will be crowned with success. But it is certain that the arrest, detention or search of such a ship in the exercise of local jurisdiction—as under the American liquor regulations—is likely to attract much more attention and excite much stronger resentment than similar treatment of a private vessel. Further, any form of protection or discrimination, as applied to the competition of State-owned shipping, will give rise to additional excitement and apprehension abroad, since it will always be suspected that a political motive underlies the economic pretence.

To return to our main argument, there can be no sounder advice than that contained in the Booth Report: "Freedom of the seas, in the sense of equal treatment of all flags in all ports, should be a cardinal principle in our post-war policy." In a business so essentially international, it is only by universal equality of opportunity that the possibility of dangerous friction can be avoided, or the industry itself enabled to make its maximum contribution to the development of the world's economic life.

It is a policy which, above all others, is suited to the needs of British shipping, which neither seeks nor desires to be sheltered from fair competition; but the objection will be raised that the validity of the policy depends upon its universal application. So long as other nations continue to pass discriminatory legislation in favour of their own shipping, to impose differential dues, to exclude British ships from their coasting traffic, and to extend the definition of that traffic to include the colonial trade, it may plausibly be argued that British shipowners will be placed at a disadvantage in international competition unless they too receive the backing of their Government, and that measures of retaliation should be applied, when necessary, in order to secure reciprocal treatment for British ships.

It is impossible to lay down a hard-and-fast rule on this point. There are, however, two very pertinent facts to be borne in mind. Firstly, experience suggests that retaliation is apt to produce countermeasures of progressive stringency, rather than the removal of restrictions. Secondly, we are likely, for reasons already stated, to suffer greater damage than we inflict.

There are signs here and there of a dawning realisation that the world's crying need is for the removal rather than the multiplication of obstacles to the exchange of goods and services. It would be a heavy blow to all hopes of a return to sanity, if the greatest maritime Power were to abandon the liberal policy that has served her so well in the past. We shall do wisely to have the courage of our convictions, to regard the threat of retaliation as, at most, a last resort, and to concentrate rather on every opportunity of securing equality of treatment through treaties of commerce and navigation, and where possible, through international conventions.

NEED FOR INTERNATIONAL CO-OPERATION.

The method of international conference has already done much good work in maritime affairs, and it is obviously the best way of dealing with the grosser forms of flag discrimination, such as restrictions on the right of transit, or differential treatment of ships passing through international waterways. In such matters, the interest of most nations is on the side of freedom, and the very publicity of the discussions at a conference renders it more difficult for a dissentient Government to maintain an unreasonable attitude. Moreover, where a false principle has been widely applied, it is easier for several nations to yield their pretensions than for one to do so by itself.

It is high time, too, that a conference should be called for the further consolidation and elucidation of international law with regard to maritime affairs. We have had more than one sharp reminder lately that the existing law with regard to such matters as the extent of territorial waters and the jurisdiction exercisable therein, is neither clear in itself, nor closely related to the needs and conditions of present-day international intercourse. The conflict existing between the law of the port and the law of the flag in such matters as the American "right to quit," is another illustration of the need for a more workable code. To wait until specific difficulties arise for diplomatic settlement, is to run the risk both of an unnecessary quarrel and of a compromise decision leaving a bad precedent for the future.

Co-operation both between Governments and between the shipowners of different countries has already been carried far in respect of such matters as safety standards and conditions afloat. While shipowners rightly deprecate unnecessary or ill-informed interference with their conduct of a highly technical business, the social conscience of the community and the sense of Governmental responsibility have developed too far for a return to unrestricted *laissez-faire*. Such matters cannot, however, in an international industry, safely be left to purely domestic legislation. Countries with a highly developed social conscience will be compelled by the pressure of public opinion to impose standards that put their shipowners at a disadvantage in competition with rivals working under a laxer code. Countries with little maritime experience will be apt to exact, and to impose on foreign shipping in their ports, standards that have no justification in necessity and are burdensome to trade. The general adoption of international standards is a safeguard against both unfair competition and unreasonable interference. In order, however, that official regulation of shipping may be kept within the limits of what is practicable, reasonable, and necessary, it is essential that the Governments should invite and receive the co-operation of the shipowners themselves. Fortunately, British owners have been quick to realise that, both in these matters and in such matters as shipowner's liability and the form of shipping documents, uniformity of practice is economically as well as politically desirable. The International Conference of 1921, which met at the instigation of the Chamber of Shipping of the United Kingdom, was a great step in advance, which, it may be hoped, will be followed up. The International Maritime Committee are doing invaluable work in respect of the standardisation of shipping documents. The shipping industry, both in this and in other countries, is highly organised, and it can best protect itself from unwarrantable interference by proving its ability to secure by international agreement the highest standard of safety and efficiency and fair conditions for the shipper, the passenger, and the seaman. Where such conditions require legislative sanction in order to prevent the more scrupulous from being penalised in competition with the less scrupulous owner, it should be a main object of the British Government to secure that such sanctions are internationally applied.

In every phase of maritime policy, Great Britain has hitherto led the way—in equal treatment of all flags, in the development of maritime law, in adopting high standards of safe navigation and commercial practice. By adhering to these principles and by taking the lead in every movement for their international application, she will best serve both her own interests and the peace and prosperity of the world.

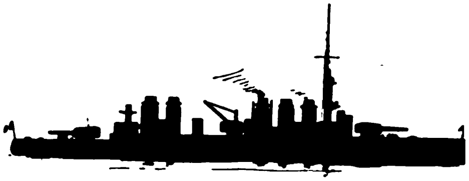
C. Ernest Fayle.

PROFILES OF BRITISH AND FOREIGN WARSHIPS AND MERCHANT SHIPS.

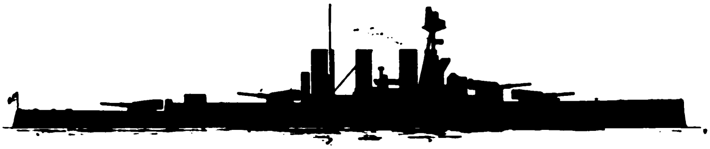
[In order to facilitate identification, the ships are arranged in accordance with the number of funnels and masts, as these are the features most easily distinguished at a distance. The page indicated, in the case of warships, refers the reader to the table where full particulars of the ships will be found. All the profiles are drawn to the scale ½ in. = 100 ft.]

CAPITAL SHIPS.

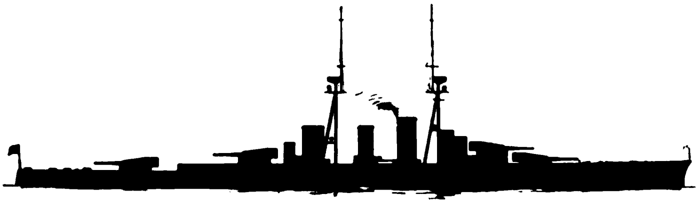
[In order to facilitate identification, the ships are arranged in accordance with the number of funnels and masts, as these are the features most easily distinguished at a distance. The page indicated, in the case of warships, refers the reader to the table where full particulars of the ships will be found. All the profiles are drawn to the scale ½ in. = 100 ft.]



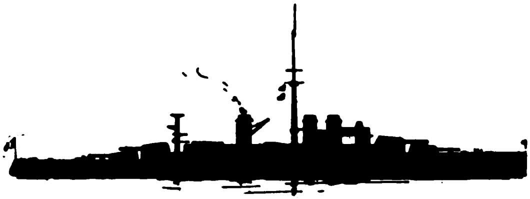
FRANCE. Battleships. Condorcet, Diderot. (See p. 436.)



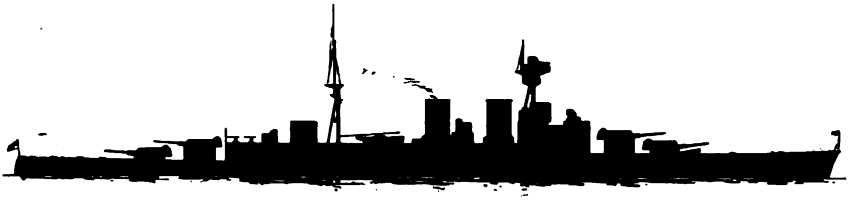
GREAT BRITAIN. Battle-cruiser. Tiger. (See p. 424.)



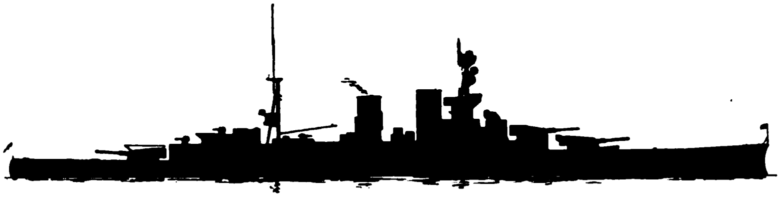
JAPAN. Battle-cruisers. Haruna, Hiyei, Kongo, Kirishima. (See pp. 444 and 445.)



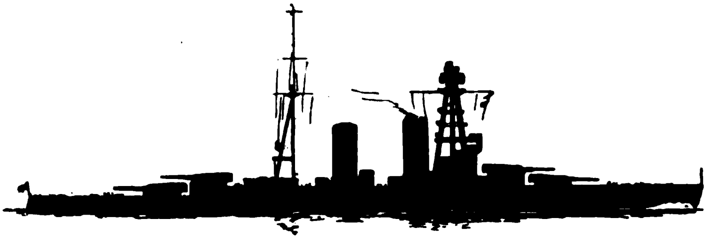
FRANCE. Battleships. Courbet, Jean Bart, Paris. (These three ships are being rebuilt, and will be similar in design to Battleships Bretagne, Lorraine, Provence. (See pp. 436 and 437.)



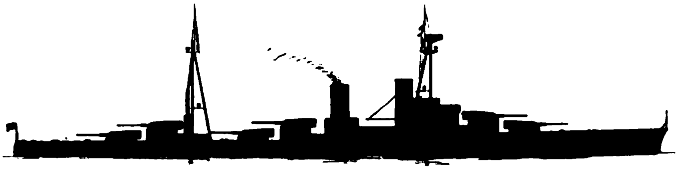
GREAT BRITAIN. Battle-cruiser. Hood. (See p. 422.)



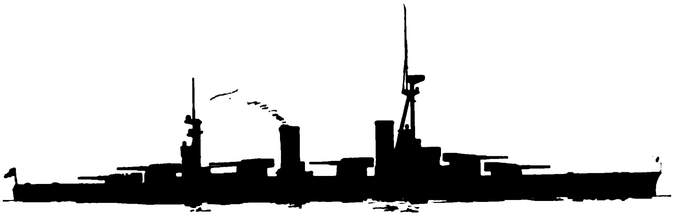
GREAT BRITAIN. Battle-cruisers. Renown, Repulse. (See p. 423.)



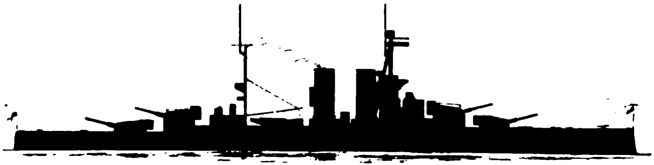
JAPAN. Battleships. Mutsu, Nagato. (See p. 445.)



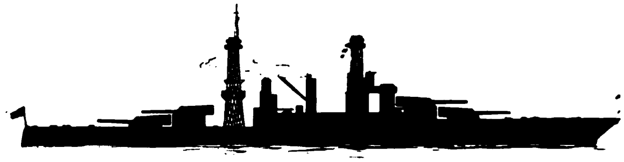
JAPAN. Battleships. Hyuga, Ise. (See p. 444.)



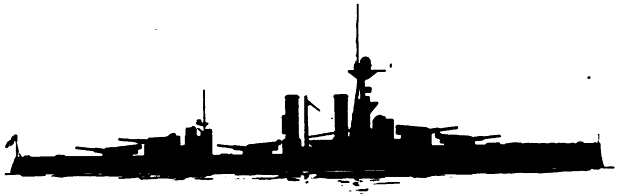
JAPAN. Battleships. Fuso, Yamishiro. (See pp. 444 and 445.)



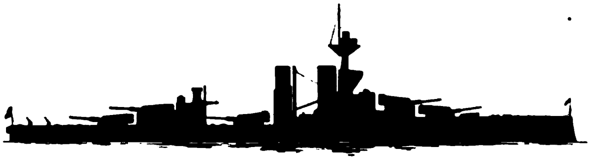
GREAT BRITAIN. Battleships. Barham, Malaya, Queen Elizabeth, Valiant, Warspite. (See pp. 422, 423, and 424.)



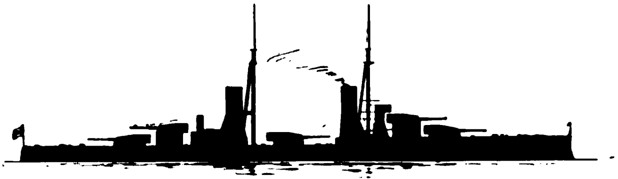
UNITED STATES. Battleships. California, Tennessee, Colorado, Maryland, West Virginia. (See pp. 453, 455, 456, and 457.)



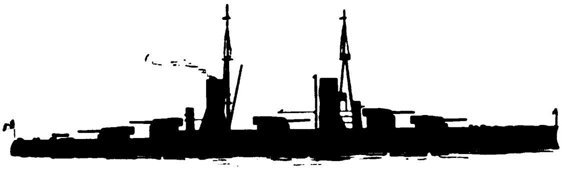
GREAT BRITAIN. Battleships. Benbow, Emperor of India, Iron Duke, Marlborough. (See pp. 422 and 423.)



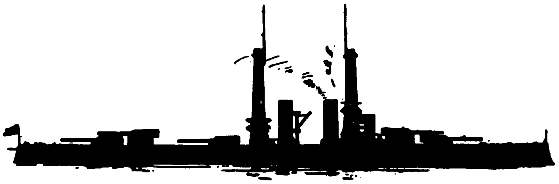
GREAT BRITAIN. Battleships. Centurion, King George V. (See p. 422.)



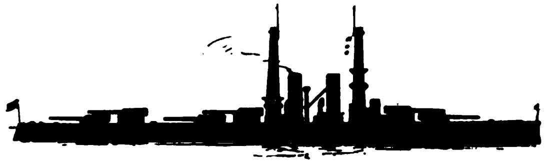
ITALY. Battleships. Andrea Doria, Caio Duilio. (See p. 441.)



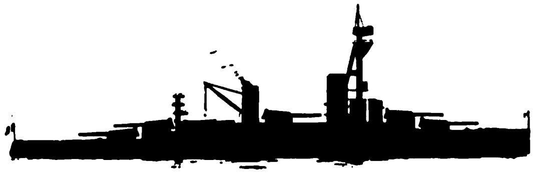
ITALY. Battleships. Conte Di Cavour, Giulio Cesare. (See p. 441.)



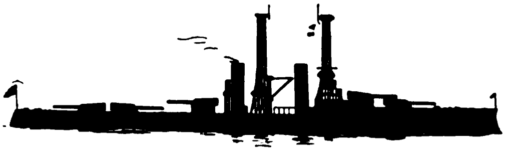
UNITED STATES. Battleships. New York, Texas. (See pp. 445 and 456.)



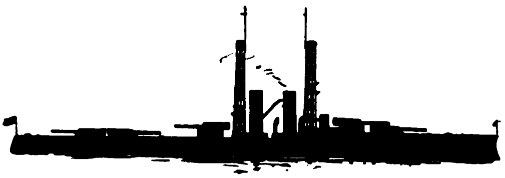
UNITED STATES. Battleships. Arkansas, Wyoming. (See pp. 458 and 457.)



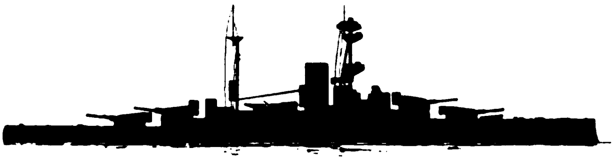
FRANCE. Battleships. Bretagne, Lorraine, Provence. (See pp. 436 and 437.)



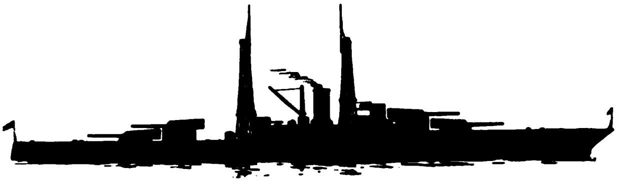
UNITED STATES. Battleships. Delaware, North Dakota. (See pp. 454 and 455.)



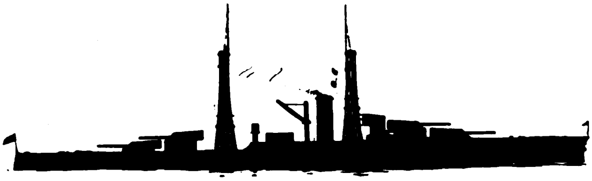
UNITED STATES. Battleships. Florida, Utah. (See pp. 454 and 457.)



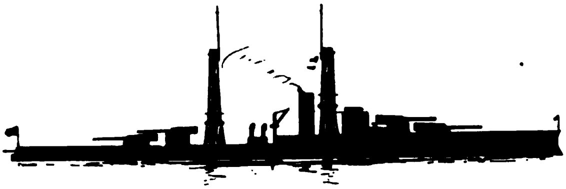
GREAT BRITAIN. Battleships. Ramillies, Resolution, Revenge, Royal Oak, Royal Sovereign. (See p. 423.)



UNITED STATES. Battleships. Idaho, Mississippi, New Mexico. (See pp. 454 and 455.)

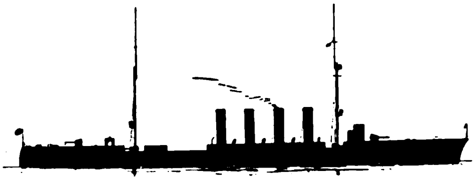


UNITED STATES. Battleships. Arizona, Pennsylvania. (See pp. 453 and 455.)

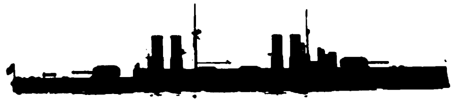


UNITED STATES. Battleships. Nevada, Oklahoma. (See p. 455.)

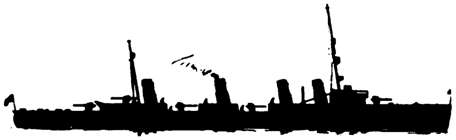
CRUISERS.



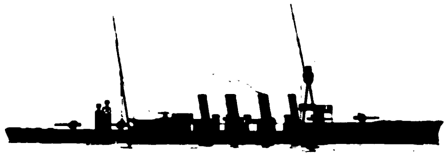
JAPAN. Cruisers Chikuma, Hirado, Yahagi. (See pp. 446 and 447.)



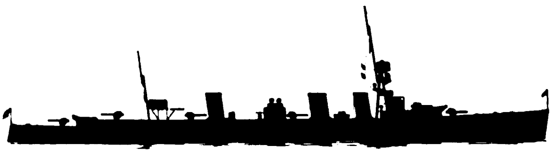
ITALY. Cruisers. San Giorgio, San Marco. (See p. 441.)



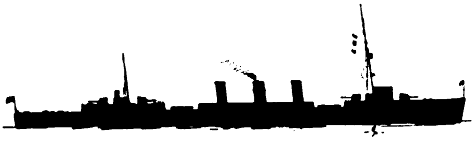
ITALY. Scout Cruisers. Marsala, Nino Bixio. (See pp. 442 and 443.)



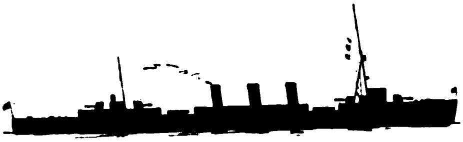
GREAT BRITAIN. Light Cruisers. Birmingham, Dublin, Lowestoft, Southampton. (See pp. 425, 428, and 429.)



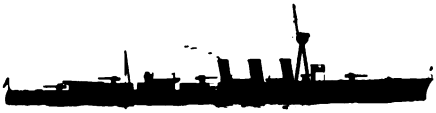
GREAT BRITAIN. Light Cruisers. Emerald, Enterprise. (See p. 428.)



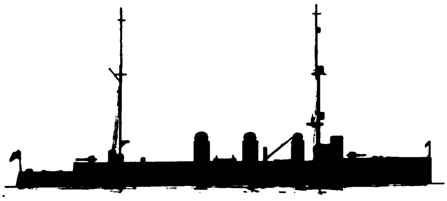
JAPAN. Light Cruisers. Tatsuta, Tenryu. (See p. 447.)



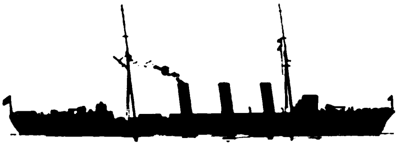
JAPAN. Armoured Crusier. Kuma. (See p. 446.)



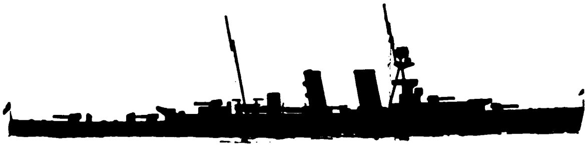
GREAT BRITAIN. Light Cruiser. Cleopatra. (See p. 426.)



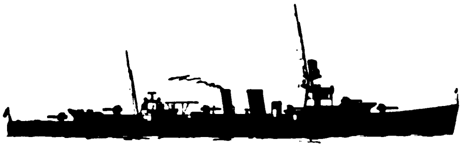
ITALY. Scout Cruiser. Quarto. (See p. 443.)



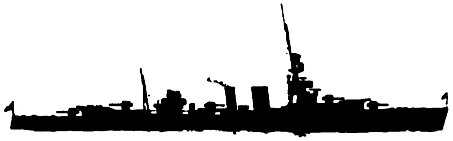
JAPAN. Second Class Cruiser. Tone. (See p. 447.)



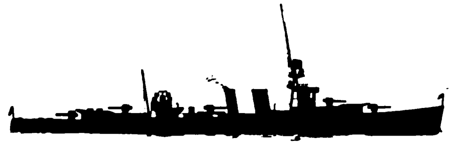
GREAT BRITAIN. Light Cruisers. Effingham, Frobisher, Hawkins, Vindictive. (See pp. 428 and 429.)



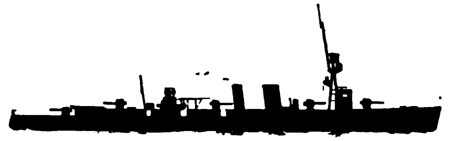
GREAT BRITAIN. Light Cruisers. Danae, Dauntless, Delhi, Dunedin, Dragon, Durban. (See pp. 427, 428.)



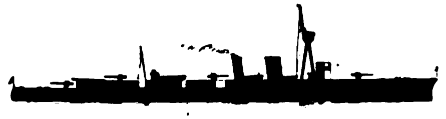
GREAT BRITAIN. Light Cruisers. Cardiff, Ceres, Coventry, Curacoa, Curlew. (See p. 427.)



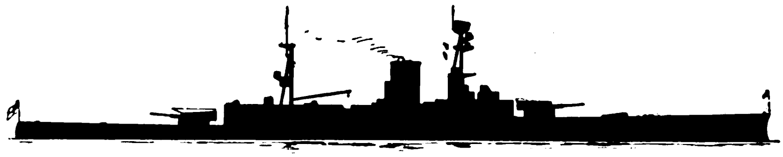
GREAT BRITAIN. Light Cruisers. Cairo, Calcutta, Cape Town, Carlisle, Colombo. (See p. 426.)



GREAT BRITAIN. Light Cruisers. Caledon, Calypso, Caradoc. (See p. 426.)

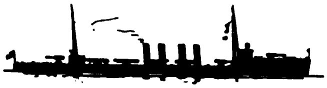


GREAT BRITAIN. Light Cruisers. Cambrian, Canterbury, Castor, Constance. (See p. 427.)

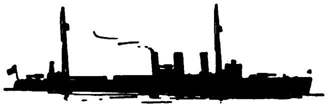


GREAT BRITAIN. Cruisers. Courageous, Glorious. (See p. 425.)

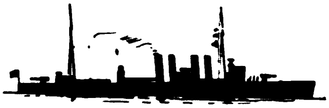
TORPEDO BOAT DESTROYERS.



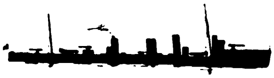
UNITED STATES. Torpedo Boat Destroyers. **Allen, Alywin, Conyngham.** (See p. 476.)



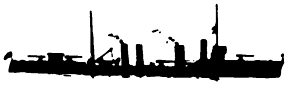
UNITED STATES. Torpedo Boat Destroyer. **Caldwell.** (See p. 476.)



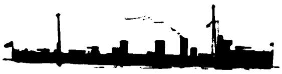
UNITED STATES. Torpedo Boat Destroyer. **Clemson.** (See p. 476.)



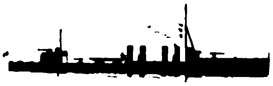
FRANCE. Torpedo Boat Destroyers. **Algérian, Annamite, Arabe, Bambara. Hova, Kabyle, Marocain, Sakalave, Sénégalais, Somali, Tonkinois, Touareg,** (See p. 469.)



FRANCE. Torpedo Boat Destroyers. **Aventurier, Intrépide, Téméraire.** (See p. 469.)

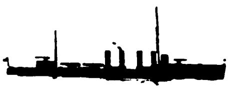


JAPAN. Torpedo Boat Destroyer. **Kaba.** (See p. 473.)

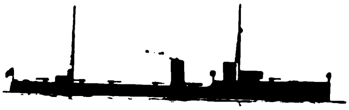


FRANCE. Torpedo Boat Destroyers. **Enseigne Roux, Mécanicien Principal Lestin.** (See p. 469.)

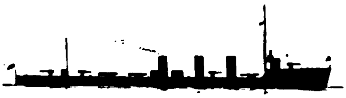
ITALY. Torpedo Boat Destroyers. **Angelo Bassini, E. Cosenz, Francesco Stocco, Giacinto Carini, Giacomo Medici, Giovanni G. Acerbi, Giuseppe la Farina, Giuseppe la Masa, Giuseppe Sirtori, Nicola Fabrizii, Vincenzo G. Orsini..** (See p. 471.)



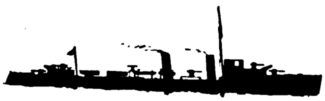
FRANCE. Torpedo Boat Destroyers. **Bouclier, Casque, Cimeterre.** (See p. 496.)



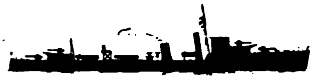
ITALY. Torpedo Boat Destroyer. **Carlo Mirabello.** (See p. 442.)



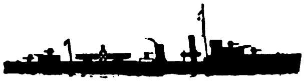
JAPAN. Torpedo Boat Destroyer. **Amatsukaze.** (See p. 472.)



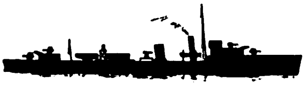
GREAT BRITAIN. Torpedo Boat Destroyer. **Broke.** (See p. 466.)



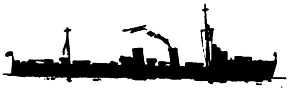
GREAT BRITAIN. Torpedo Boat Destroyers. Vansittart, Venomous, Verity, Volunteer, Wanderer, Whitehall, Whitshed, Wild Swan, Wishart, Witch, Wren. (See p. 466.)



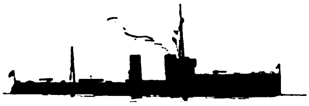
GREAT BRITAIN. Torpedo Boat Destroyers. Vancouver, Vanessa, Vanity, Vanoc, Vanquisher, Vectis, Vega, Velox, Vendetta, Venetia, Venturous, Verdun, Versatile, Vesper, Vidette, Vimiera, Violent, Vivacious, Vivien, Vortigern. (See p. 466.)



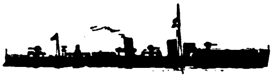
GREAT BRITAIN. Torpedo Boat Destroyers. Viceroy, Viscount, Voyager, Wakeful, Walker, Walpole, Walrus, Warwick, Watchman, Waterhen, Wessex, Westcott, Westminster, Whirlwind, Whitley, Winchelsea, Winchester, Wolfhound, Wolsey, Woolston, Wrestler, Wryneck. (See p. 466.)



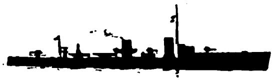
JAPAN. Torpedo Boat Destroyer. Momo. (See p. 473.)



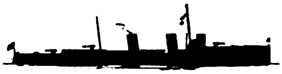
ITALY. Torpedo Boat Destroyer. Alessandro Poerio. (See p. 471.)



GREAT BRITAIN. Torpedo Boat Destroyers. Tower, Trenchant, Ulster, Umpire, Undine, Urchin, Ursa, Ursula. (See p. 466.)

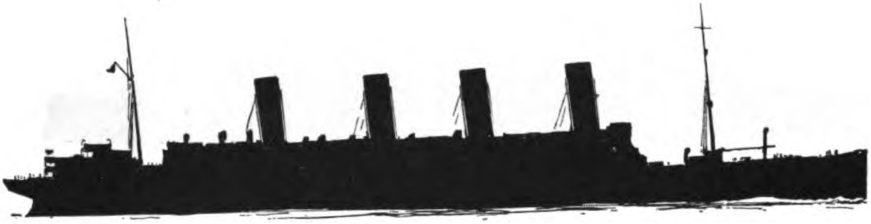


GREAT BRITAIN. Torpedo Boat Destroyers. Shikari, Simoom, Tasmania, Tattoo. (See pp. 430 & 466.)

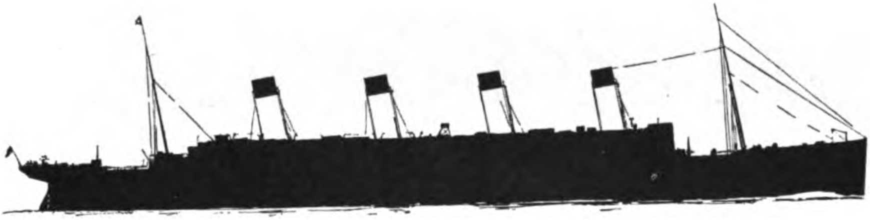


ITALY. Torpedo Boat Destroyer. Palestro. (See p. 471.)

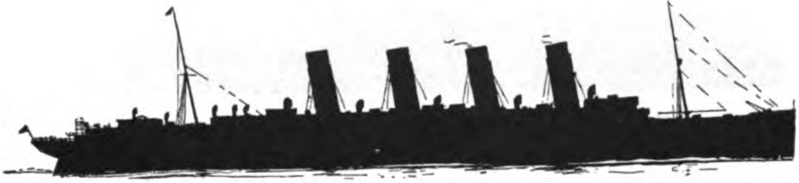
MERCHANT SHIPS.



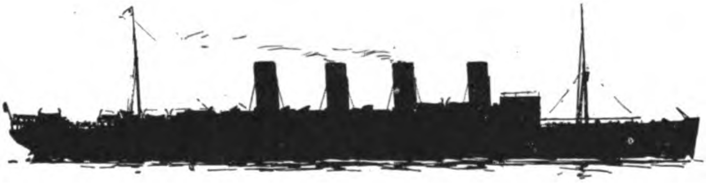
AQUITANIA. Cunard. Length, 868 ft. 7 ins.; Gross Tonnage, 45,647; Funnels: Red, Black Tops.



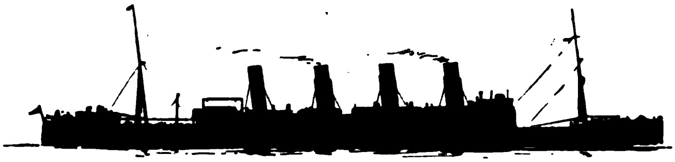
OLYMPIC. White Star. Length, 852 ft. 5 ins.; Gross Tonnage, 46,439; Funnels: Buff, Black Tops.



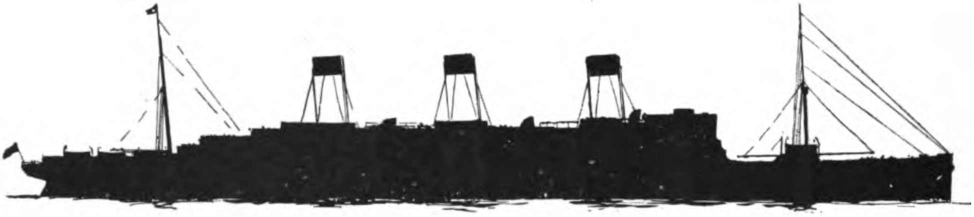
MAURETANIA. Cunard. Length, 762 ft. 2 ins.; Gross Tonnage, 30,696; Funnels: Red, Black Tops.



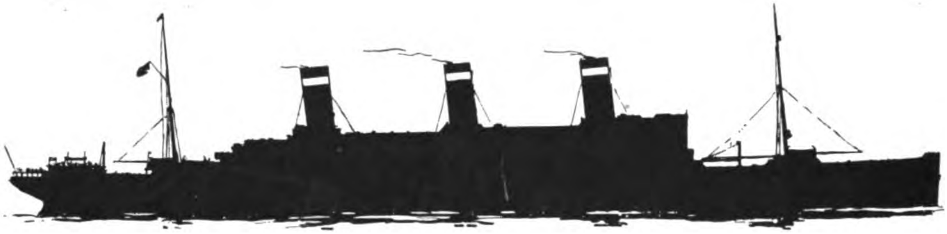
FRANCE. Cie. Générale Transatlantique. Length, 689 ft. 2 ins.; Gross Tonnage, 23,666; Funnels: Red, Black Tops.



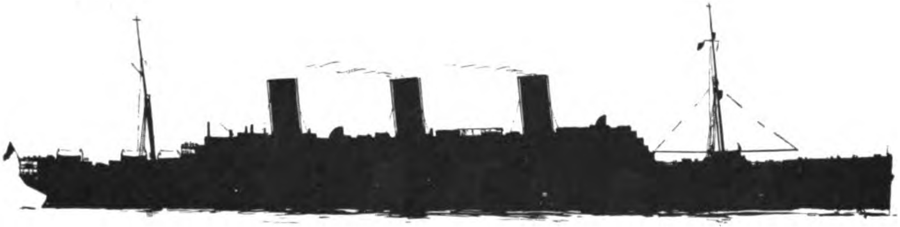
ARUNDEL CASTLE. Union Castle. Length, 630 ft. 5 ins. Gross Tonnage, 18,980: Funnels: Red, Black Tops.



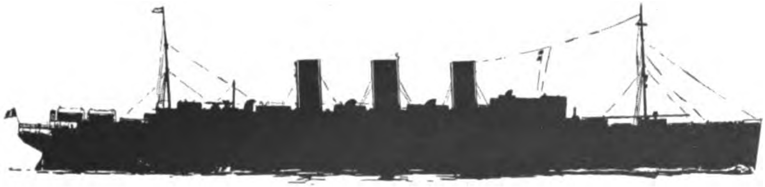
MAJESTIC. White Star. Length, 915 ft. 5 ins.; Gross Tonnage, 56,551; Funnels: Buff, Black Tops.



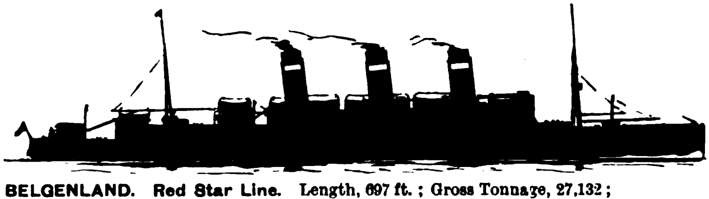
LEVIATHAN. United States Shipping Board. Length, 907 ft.; Gross Tonnage, 59,957; Funnels: Red, White Band, Blue Tops.



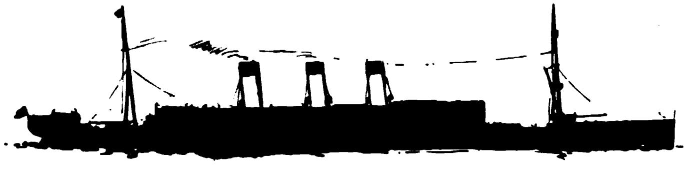
BERENGARIA. Cunard. Length, 883 ft. 6 ins.; Gross Tonnage, 52,226; Funnels: Red, Black Tops.



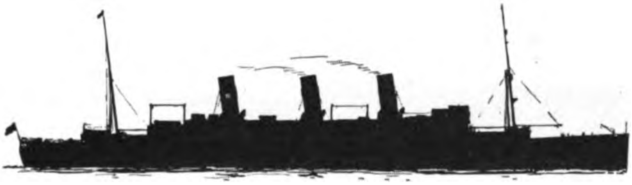
PARIS. Cie. Générale Transatlantique. Length, 735 ft. 4 ins.; Gross Tonnage, 34,569; Funnels: Red, Black Tops.



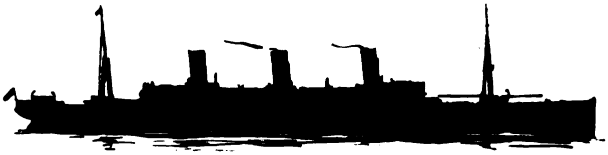
BELGENLAND. Red Star Line. Length, 697 ft.; Gross Tonnage, 27,132; Funnels: Black, White Band.



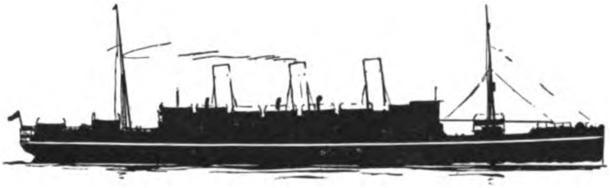
CAP POLONIO. Hamburg South Amerika. Length, 637·7 ft. Gross Tonnage, 20,576; Funnels: White Red Tops.



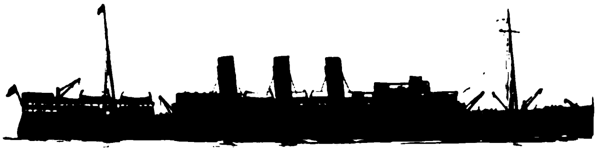
EMPRESS OF CANADA. Canadian Pacific. Length, 627 ft.; Gross Tonnage, 21,517; Funnels: Yellow.



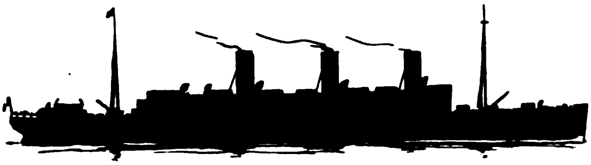
RELIANCE. American Mail Corporation. Length, 592 ft.; Gross Tonnage, 16,798, Funnels: Yellow, Two Blue Bands.



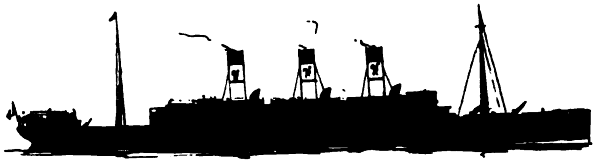
EMPRESS OF AUSTRALIA. Canadian Pacific Length, 589 ft. 8 ins.; Gross Tonnage, 21,861; Funnels: Yellow.



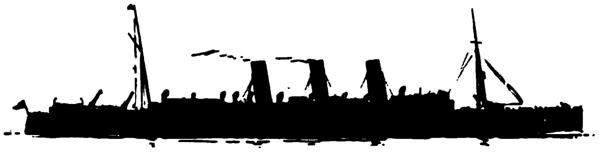
NALDERA. Peninsular and Oriental. Length, 580 ft. 9 ins.; Gross Tonnage, 15,825;
NARKUNDA. „ „ „ Length, 581 ft. 4 ins.; Gross Tonnage, 16,118;
Funnels: Black.



MASSILIA. Cie. Sud Atlantique. Length, 579 ft.; Gross Tonnage, 15,147; Funnels: Buff, Black Tops. Cockerel on sides.

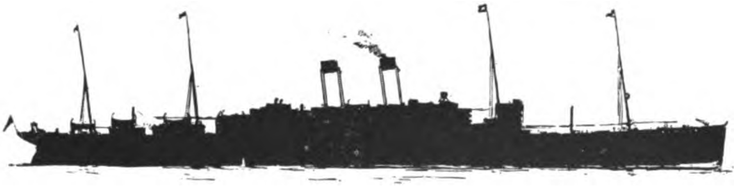


LUTETIA. Cie. Sud Atlantique. Length, 579 ft.; Gross Tonnage, 14,654;
Funnels: Buff, Black Tops. Cockerel on side.

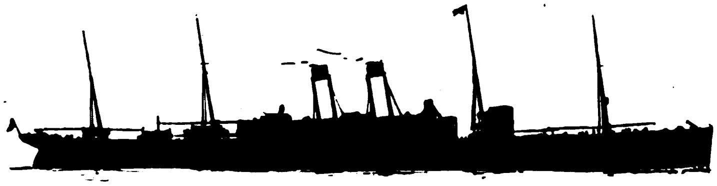


EMPRESS OF ASIA. EMPRESS OF RUSSIA. Canadian Pacific.
Length, 570 ft. 1 in.; Gross Tonnage, 16,810;
Funnels: Yellow.

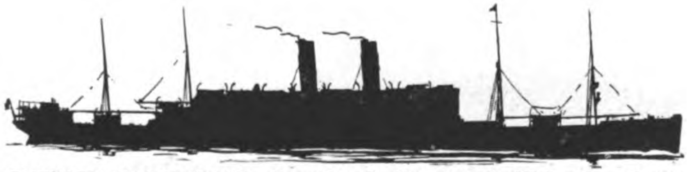
CUIDAD DE BUENOS AIRES. CUIDAD DE MONTE VIDEO. Argentine Steam Navigation Co. Length, 350 ft.; Gross Tonnage, 3,864;
Funnels: Yellow, Black Tops.



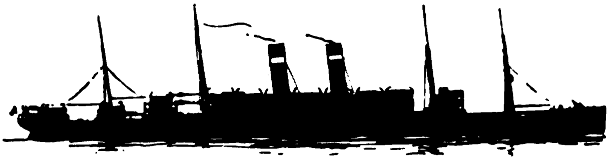
ADRIATIC. White Star. Length, 709 ft. 2 ins.; Gross Tonnage, 24,541;
Funnels: Buff, Black Tops.



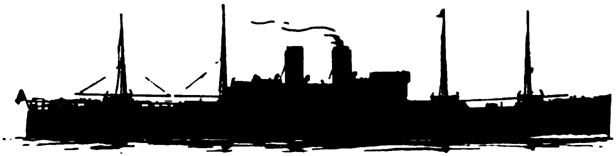
CEDRIC. CELTIC, White Star. Length, 680 ft. 9 ins.; Gross Tonnage, 21,073;
Funnels: Buff, Black Tops.



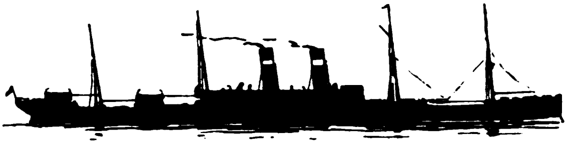
EMPRESS OF SCOTLAND. Canadian Pacific. Length, 677 ft.; Gross Tonnage, 25,037;
Funnels: Yellow.



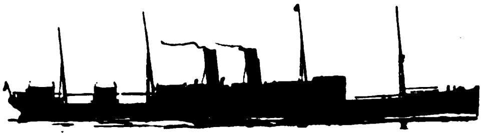
LAPLAND. **Red Star Line.** Length, 605 ft.; Gross Tonnage, 18,565;
Funnels: Black, White Band.



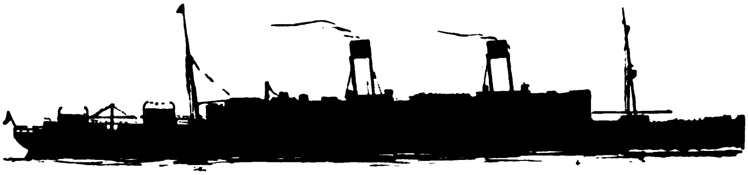
ALBERT BALLIN. DEUTSCHLAND. Hamburg Amerika Line. Length, 602 ft. 6 ins.;
Gross Tonnage, 22,000;
Funnels: Yellow.



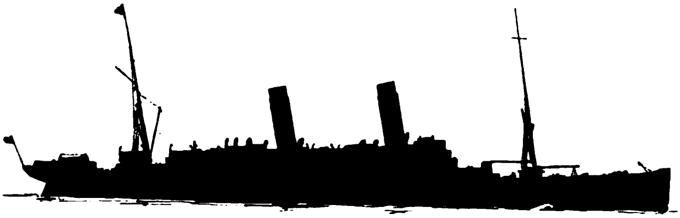
FINLAND. KROONLAND. International Mercantile Marine Corpn. Length, 560 ft.;
Gross Tonnage, 12,230;
Funnels: Black, White Band.



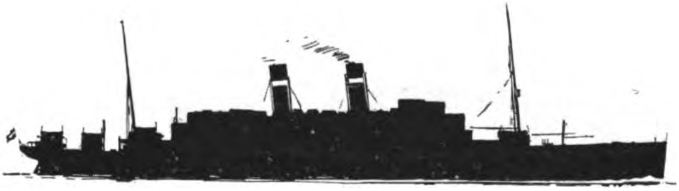
LATVIA. Det Ostasiatiske Kompagnie Akties. Length, 475 ft.; Gross Tonnage, 8,832;
Funnels: Yellow.



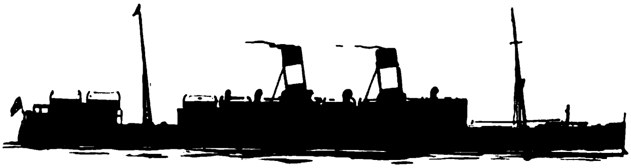
HOMERIC. White Star. Length, 751 ft.; Gross Tonnage, 34,356;
Funnels: Buff, Black Tops.



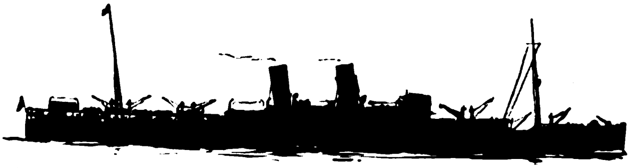
CARONIA. **Cunard.** Length, 650 ft.; Gross Tonnage, 19,687; Funnels: Red, Black Tops.



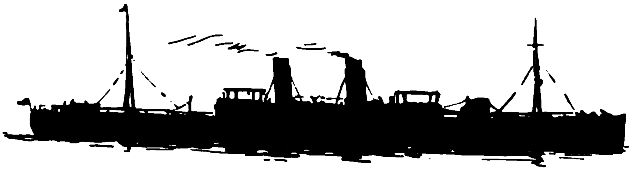
ROTTERDAM. **Holland Amerika.** Length, 650 ft.; Gross Tonnage, 24,149; Funnels: Buff, Two Blue Bands with White Band between, Buff Top.



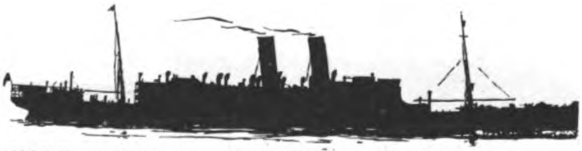
GIULIO CESARE. **Navigazione Generale Italiana.** Length, 626 ft.; Gross Tonnage, 21,657; Funnels: Black, Broad White Band.



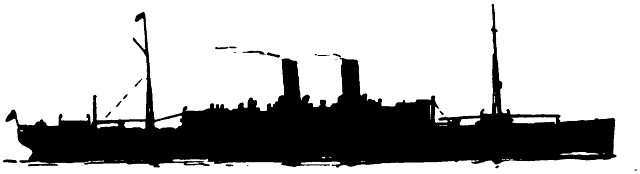
MOOLTAN. MALOJA. **Peninsular and Oriental.** Length, 625 ft.; Gross Tonnage, 27,000; Funnels: Black.



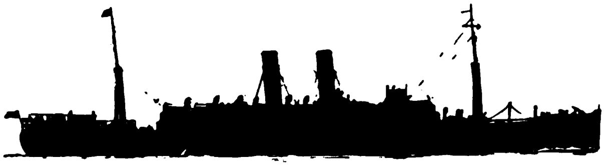
REGINA. **White Star—Dominion Line.** Length, 600 ft.; Gross Tonnage, 16,500; Funnels: Red, White and Red Rings, Black Tops.



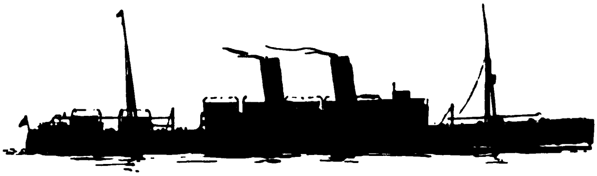
MONTLAURIER. **Canadian Pacific.** Length, 590 ft.; Gross Tonnage, 16,992; Funnels: Yellow.



OHIO. **Royal Mail Steam Packet Co.** Length, 588 ft. 8 ins.; Gross Tonnage, 18,000;
Funnels: Buff.

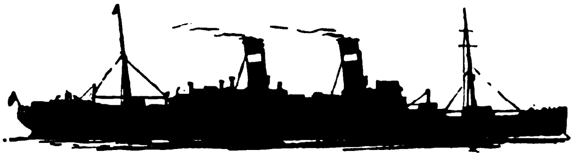


ORMONDE. **Orient.** Length, 580 ft. 5 ins.; Gross Tonnage, 14,853;
Funnels: Buff.

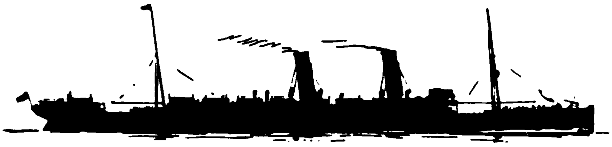


VEENDAM. VOLENDAM. **Holland America Line.** Length, 576 ft.; Gross Tonnage, 15,434;
Funnels: Buff, White Band between Two Green.

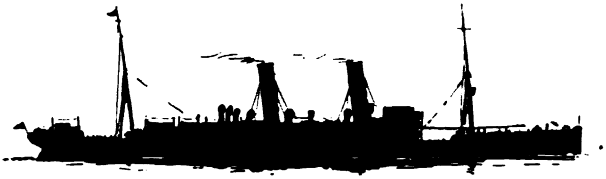
SAXON. **Union Castle.** Length, 570 ft. 5 ins.; Gross Tonnage, 12,385;
Funnels: Red, Black Tops.



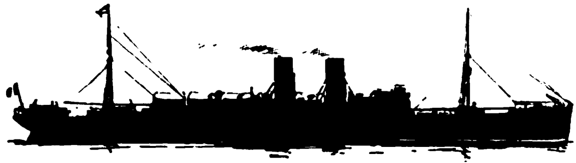
CONTE ROSSO. CONTE VERDE. **Lloyd Sabaudo.** Length, 570 ft. 2 ins.;
Gross Tonnage, 18,017;
Funnels: Yellow, White Band between Two Narrow Green.



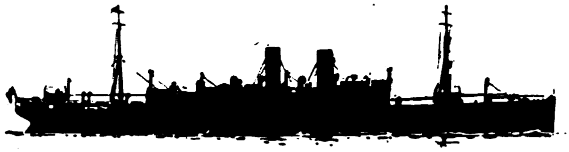
ARMADALE CASTLE. **Union Castle.** Length, 570 ft. 1 in.; Gross Tonnage, 12,973;
Funnels: Red, Black Tops.



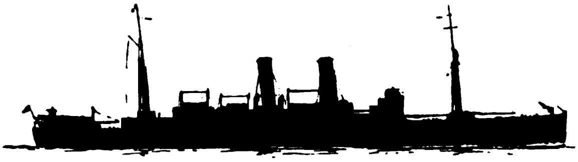
BALMORAL CASTLE. EDINBURGH CASTLE. Union Castle.
Length, 570 ft.; Gross Tonnage, 13,361;
Funnels: Red, Black Tops.



ROCHAMBEAU. Cie. Générale Transatlantique. Length, 559 ft.; Gross Tonnage, 17,400;
Funnels: Red, Black Tops.

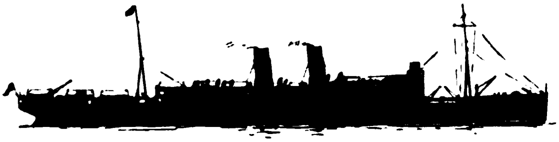


ORMUZ. Orient. Length, 550 ft.; Gross Tonnage, 14,588;
Funnels: Buff.

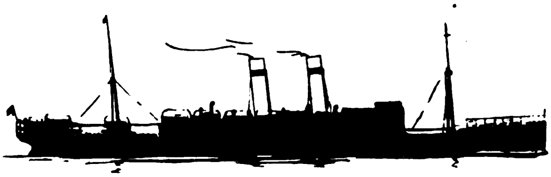


MONTCALM. MONTCLARE. MONTROSE. Canadian Pacific.
Length, 549 ft. 5 ins.; Gross Tonnage, 16,418;
Funnels: Yellow.

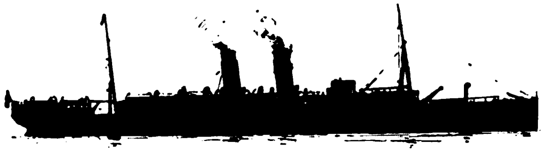
EMPRESS OF BRITAIN. Canadian Pacific. Length, 548 ft. 8 ins.; Gross Tonnage, 15,857;
Funnels: Yellow.



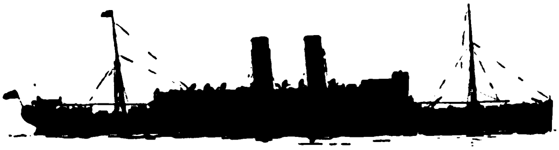
MALWA. MANTUA. MOREA. Peninsular and Oriental. Length, 540 ft.;
Gross Tonnage, 10,941;
Funnels: Black.



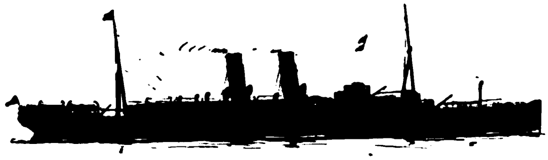
GELRIA. **Koninklijke Hollandsche Lloyd.** Length, 540 ft. ; Gross Tonnage, 13,868 ; Funnels : Yellow, Black Band.



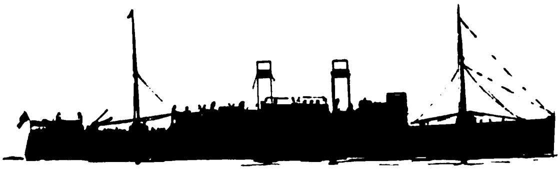
ORSOVA. **Orient.** Length, 536 ft. 2 ins. ; Gross Tonnage, 12,036 ; Funnels : Buff.



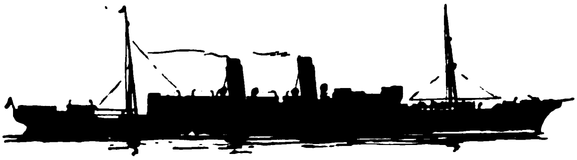
ORVIETO. **Orient.** Length, 535 ft. 3 ins. ; Gross Tonnage, 12,133 ; Funnels : Buff.



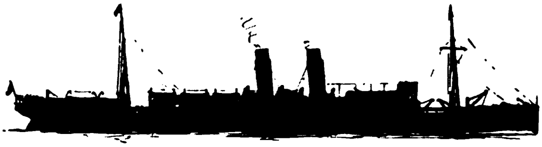
OSTERLEY. **Orient.** Length, 535 ft. ; Gross Tonnage, 12,129 ; Funnels : Buff.



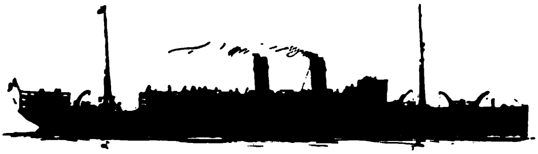
STAVANGERFJORD. **Norske Amerikalinje.** Length, 552 ft. Gross Tonnage, 12,977 ; Funnels : Yellow, Two Red and Two White Bands with Blue Band between.



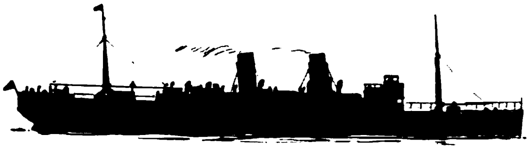
VASCO NUNEZ DE BALBOA. **Compañia Trasatlantica.** Length, 531 ft. ; Gross Tonnage, 7,842 ; Funnels : Black.



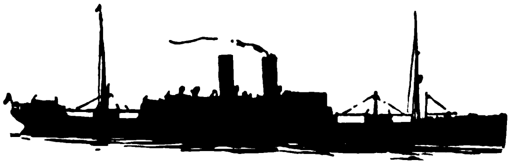
MACEDONIA. Peninsular and Oriental. Length, 530 ft. 4 ins.; Gross Tonnage, 11,089; Funnels: Black.



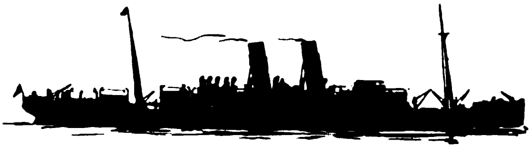
ANDRE LEBON. Messageries Maritimes. Length 528 ft.; Gross Tonnage, 13,681; Funnels: Black.



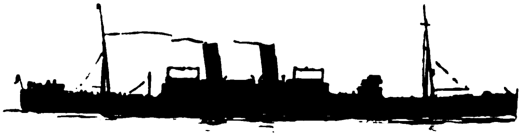
NIAGARA. Union Steam Ship Co. of N.Z. Length, 524 ft. 7 ins.; Gross Tonnage, 13,415; Funnels: Red, Black Tops.



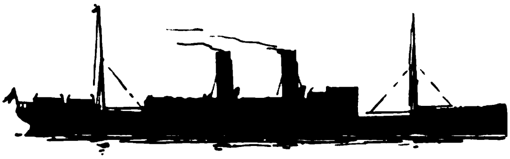
FREDERIK VIII. Det Forenede Damskibs Setskab. Length, 523 ft.; Gross Tonnage, 11,850: Funnels: Black, Red Band.



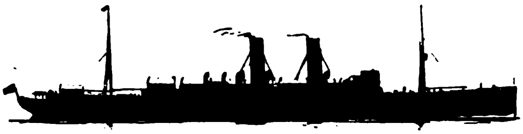
KAISER-I-HIND. Peninsular and Oriental. Length, 520 ft.; Gross Tonnage, 11,430; Funnels: Black.



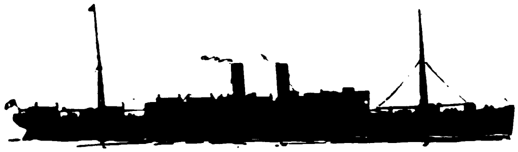
MINNEDOSA. Canadian Pacific. Length, 520 ft.; Gross Tonnage, 14.000; Funnels: Yellow.



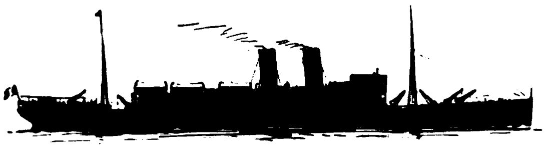
BERGENSFJORD. Norske Amerikalinje. Length, 512 ft. ; Gross Tonnage, 10,709 ; Funnels : Yellow, Two Red and Two White Bands with Blue Band between.



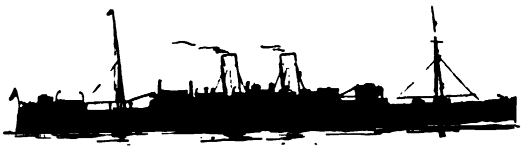
H. F. ALEXANDER. Admiral Line. Length, 509 ft. Gross Tonnage, 8,255 ; Funnels : Tan, Black Top, White Disc with Flag.



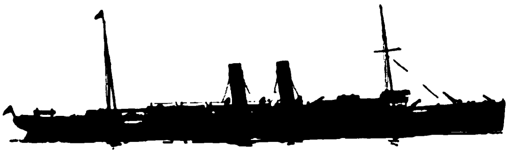
CHICAGO. Cie. Générale Transatlantique. Length, 508 ft. ; Gross Tonnage, 14,250 ; Funnels : Red, Black Tops.



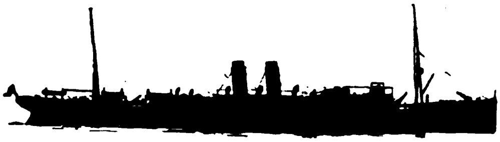
PAUL LECAT. Messageries Maritimes. Length, 508 ft. ; Gross Tonnage, 12,988 ; Funnels : Black.



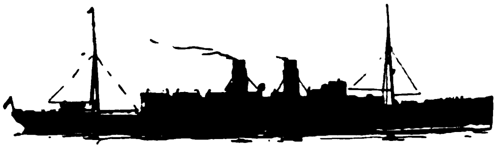
METAGAMA. Canadian Pacific. Length, 500 ft. 4 ins. ; Gross Tonnage, 12,420 ; Funnels : Yellow.



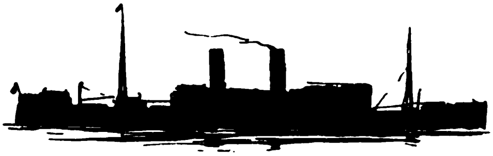
CHINA. Peninsular and Oriental. Length, 500 ft. 5 ins. ; Gross Tonnage, 7,952 ; Funnels : Black.



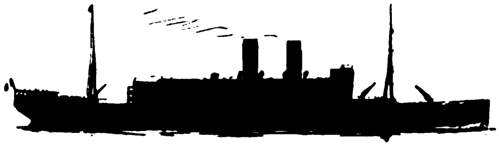
CALEDONIA. Peninsular and Oriental. Length, 486 ft. ; Gross Tonnage, 7,622 ; Funnels : Black.



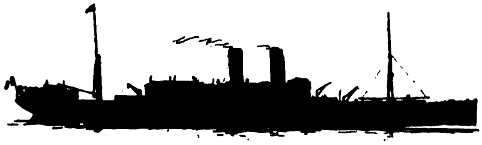
ALFONSO XII. Compañia Trasatlantica. Length, 481 ft. 4 ins. ; Gross Tonnage, 6,748 ; Funnels : Black.



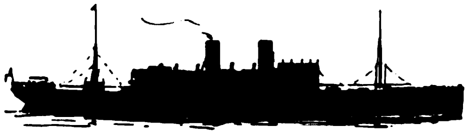
PATRIA. Wm. Ruys & Zonen. Length, 480 ft. ; Gross Tonnage, 9,891 ; Funnels : Black.



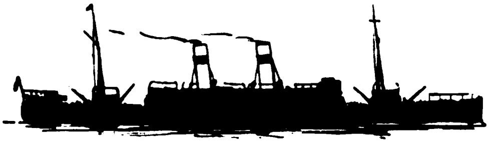
SPHINX. Messageries Maritimes. Length, 479 ft. ; Gross Tonnage, 11,374 ; Funnels : Black.



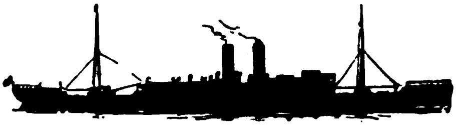
PORTHOS. Messageries Maritimes. Length, 476 ft. ; Gross Tonnage, 12,691 ; Funnels : Black.



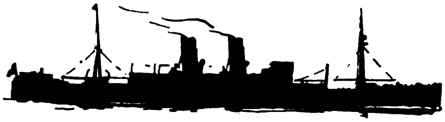
CUBA. Cie. Générale Transatlantique. Length, 476 ft. ; Gross Tonnage, 11,400 ; Funnels : Red, Black Tops.



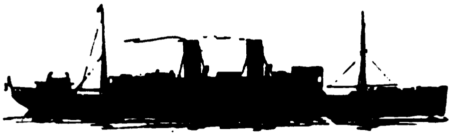
FLANDRIA. ORANIA. Koningen Hollandsche Lloyd. Length, 470 ft.; Gross Tonnage, 9,678; Funnels: Yellow, Black Band.



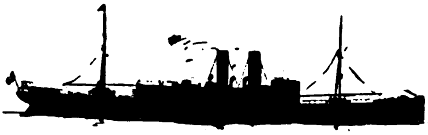
PEROU. Cie. Générale Transatlantique. Length, 449 ft.; Gross Tonnage, 6,600; Funnels: Red, Black Tops.



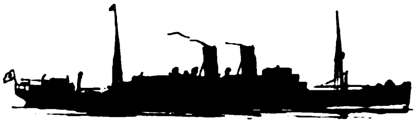
DE LA SALLE. Cie. Générale Transatlantique. Length, 440 ft.; Gross Tonnage, 7,500; Funnels: Red, Black Tops.



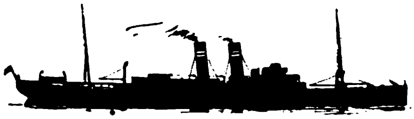
ASIE. Chargeurs Reunis. Length, 439 ft.; Gross Tonnage, 9,059; Funnels: Yellow, Red Stars on White Band.



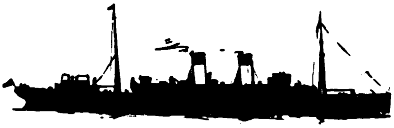
HAYTI. Cie. Générale Transatlantique. Length, 410 ft.; Gross Tonnage, 6,179; Funnels: Red, Black Tops.



NAGASAKA MARU. SHANGHAI MARU. Nippon Yusen Kaisha. Length, 402 ft.; Gross Tonnage, 5,272; Funnels: Black.

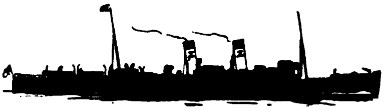


ARANKOLA. **British India S.N. Co.** Length, 390 ft. 3 ins.; Gross Tonnage, 4,129;
Funnels: Black, Two White Bands, Black Tops.



ANGLIA. CAMBRIA. HIBERNIA. SCOTIA. **London, Midland and Scottish Railway.**
Length, 380 ft. 5 ins.; Gross Tonnage, 3,460;
Funnels: Yellow, Black Tops.

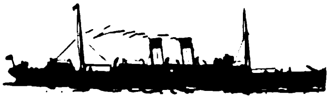
WAHINE. **Union Steam Ship Co. of N.Z.** Length, 375 ft.; Gross Tonnage, 4,436;
Funnels: Red, Black Tops.



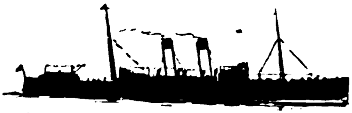
KEIFUKU MARU. **"K" Line.** Length, 375 ft.; Gross Tonnage, 5,857;
Funnels: Black, Red Top, Large White K in Red.

GOUVERNEUR GENERAL CHANZY. **Commission aux Transports Maritimes Marine Marchand.** Length, 361 ft.; Gross Tonnage, 4,500.

ST. ANDREW. ST. DAVID. ST. PATRICK. **Great Western Railway.**
Length, 351 ft. 1 in.; Gross Tonnage, 2,495;
Funnels: Red, Black Tops.



ARVONIA. MENEVIA. **London, Midland and Scottish Railway.** Length, 329 ft.;
Gross Tonnage, 1,842;
Funnels: Yellow, Black Tops.



ANTWERP. MALINES. **London and North Eastern Railway.** Length, 321 ft. 6 ins.;
Gross Tonnage, 2,957;
Funnels: Yellow, Black Tops.

CURRAGHMORE. **London, Midland and Scottish Railway.** Length, 307 ft. 1 in.;
Gross Tonnage, 1,587;
Funnels: Yellow, Black Tops.

GREENORE. **London, Midland and Scottish Railway.** Length, 300 ft.;
Gross Tonnage, 1,488;
Funnels: Yellow, Black Tops.

RATHMORE. **London, Midland and Scottish Railway.** Length, 299 ft. 5 ins.;
Gross Tonnage, 1,569;
Funnels: Yellow, Black Tops.

HANTONIA. **NORMANNIA.** **Southern Railway.** Length, 290 ft. 3 ins.;
Gross Tonnage, 1,567;
Funnels: Buff.

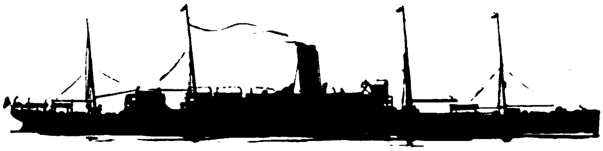
REINDEER. **Great Western Railway.** Length, 280 ft.; Gross Tonnage, 1,101;
Funnels: Red, Black Tops.

DIEPPE. **Southern Railway.** Length, 273 ft. 5 ins.; Gross Tonnage, 1,228;
Funnels: White, Black Tops.

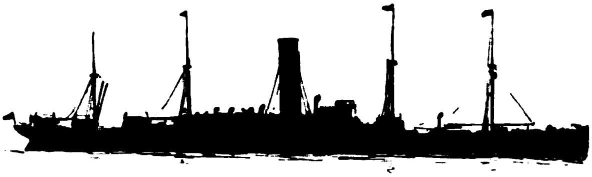
ROTORUA. **New Zealand Shipping Co.** Length, 526 ft. 6 ins.; Gross Tonnage, 12,184;
Funnel: Buff.

PRESIDENT ADAMS. **United States Shipping Board.** Length, 502 ft.; Gross Tonnage, 10,558;
PRESIDENT GARFIELD. ,, ,, ,, ,, ,, 10,558;
PRESIDENT HARRISON. ,, ,, ,, ,, ,, 10,533;
PRESIDENT HAYES. ,, ,, ,, ,, ,, 10,533;
PRESIDENT MONROE. ,, ,, ,, ,, ,, 10,533;
PRESIDENT POLK. ,, ,, ,, ,, ,, 10,533;
PRESIDENT VANBUREN. ,, ,, ,, ,, ,, 10,533;
Funnel: Red, White Band, Blue Top, U.S.A. Shield on Side.

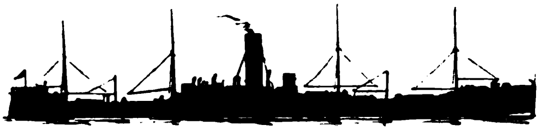
BARONESA. **Furness (Houlder).** Length, 431 ft.: Gross Tonnage, 8,663.
Funnel: Black, Red Band, White Maltese Cross, Black Top.



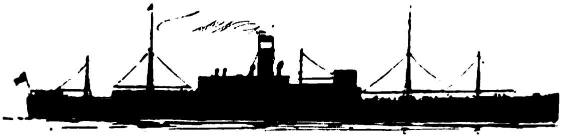
NIEUW AMSTERDAM. **Holland Amerika.** Length, 615 ft.; Gross Tonnage, 17,149;
Funnel: Buff, White Band between Two Green.



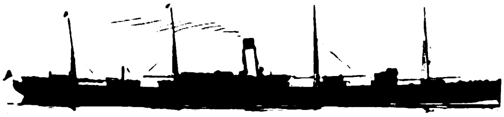
SAXONIA. **Cunard.** Length, 580 ft.; Gross Tonnage, 14,197;
Funnel: Red, Black Top.



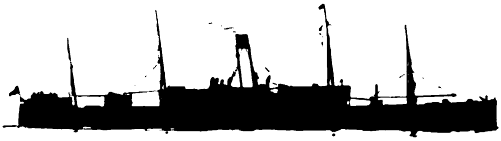
ARMAGH. **Union Steam Ship Co. of N.Z.** Length, 535 ft. 5 ins.; Gross Tonnage, 12,269;
Funnel: Red, Black Top.



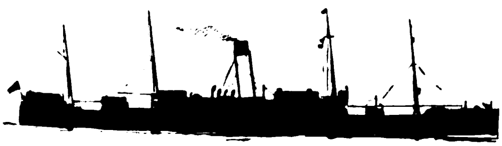
PRESIDENT ROOSEVELT. **United States Shipping Board.** Length, 535 ft.; Gross Tonnage, 14,127;
Funnel: Red, White Band, Blue Top, U.S.A. Shield on side.



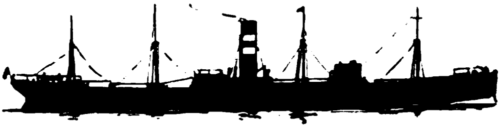
ATHENIC. **Shaw, Savill, and Albion Co.** Length, 500 ft. 3 ins.; Gross Tonnage, 12,366;
Funnel: Buff, Black Top.



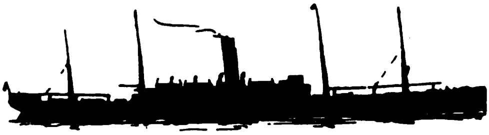
YORKSHIRE. **Bibby Line.** Length, 482 ft. 4 ins.; Gross Tonnage, 10,250;
Funnel: Salmon Pink, Black Top.



LANCASHIRE. **Bibby Line.** Length, 482 ft. 4 ins.; Gross Tonnage, 9,445;
Funnel: Salmon Pink, Black Top.

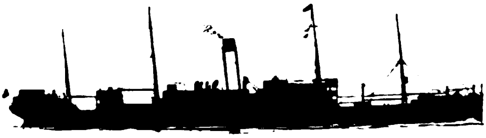


DIPLOMAT. **Harrison Line.** Length, 482 ft. ; Gross Tonnage, 8,218 ;
Funnel : Black, Red Band between Two White.

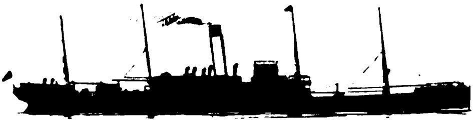


MENOMINEE. **Atlantic Transport.** Length, 475 ft. ; Gross Tonnage, 6,919 ;
Funnel : Red, Black Top.

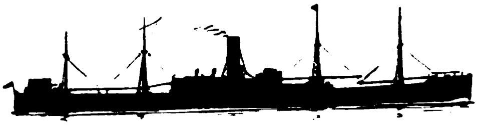
POLAND. **Atlantic Transport.** Length, 475 ft. 6 ins. ; Gross Tonnage, 8,282 ;
Funnel : Red, Black Top.



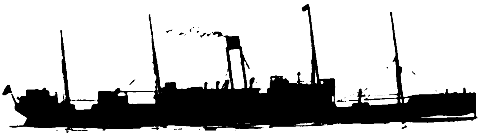
OXFORDSHIRE. **Bibby Line.** Length, 474 ft. 7 ins. ; Gross Tonnage, 8,624 ;
Funnel : Salmon Pink, Black Top.



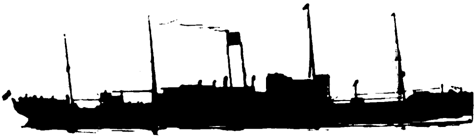
WARWICKSHIRE. **Bibby Line.** Length, 470 ft. 3 ins. ; Gross Tonnage, 8,012 ;
Funnel : Salmon Pink, Black Top.



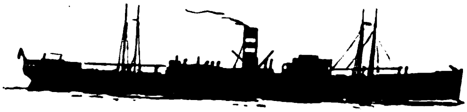
LEITRIM. **Union Steam Ship Co. of N.Z.** Length, 470 ft. ; Gross Tonnage, 9,540 ;
Funnel : Red, Black Top.



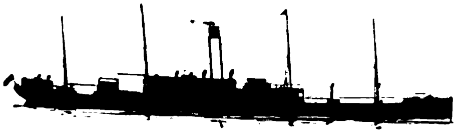
GLOUCESTERSHIRE. **Bibby Line.** Length, 467 ft. 2 ins. ; Gross Tonnage , 8,124 ;
Funnel : Salmon Pink, Black Top.



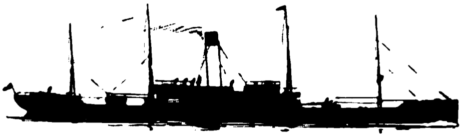
LEICESTERSHIRE. **Bibby Line.** Length, 467 ft. 2 ins. ; Gross Tonnage, 8,059 ;
Funnel : Salmon Pink, Black Top.



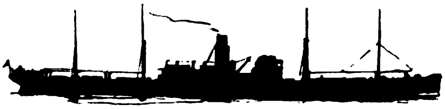
COLLEGIAN. Harrison Line. Length, 455 ft.; Gross Tonnage, 5,850; Funnel: Black, Red Band between Two White.



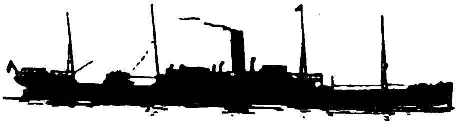
HEREFORDSHIRE. Bibby Line. Length 452 ft. 3 ins.; Gross Tonnage, 7,192; Funnel: Salmon Pink, Black Top.



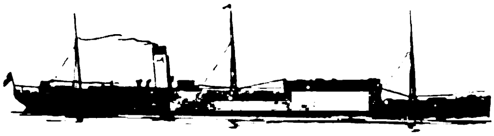
DERBYSHIRE. Bibby Line. Length, 452 ft.; Gross Tonnage, 6,776; Funnel: Salmon Pink, Black Top.



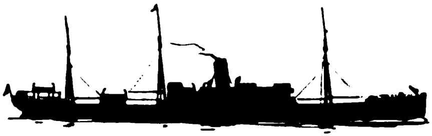
HYACINTHUS. HYPATIA. Houston Line. Length, 452 ft.; Gross Tonnage, 5,725; Funnel: Red, Black Top, Two Black Bands.



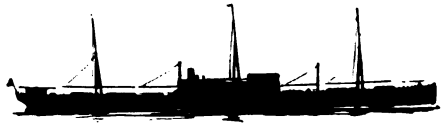
SAMARIA. Cie. Sud Atlantique. Length, 445 ft.; Gross Tonnage. 6007; Funnel: Yellow, Black Top.



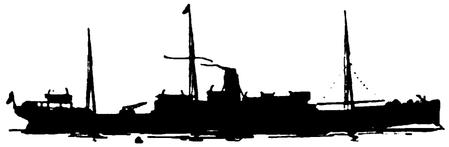
MAUI. Matson Navigation Co. Length 484 ft.; Gross Tonnage, 9,801; Funnel: Yellow, Black Top, with "M."



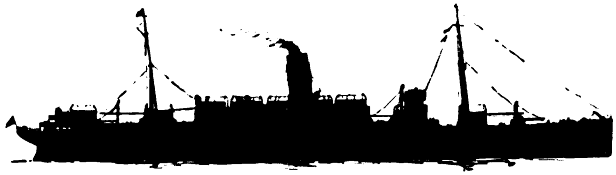
MANUEL CALVO. Compañia Trasatlantica. Length 435 ft.; Gross Tonnage, 5,617; Funnel: Black.



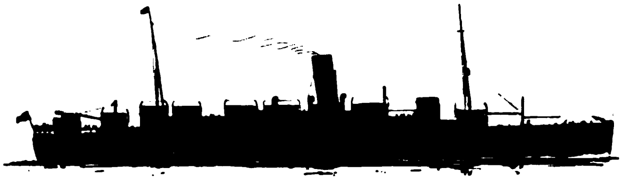
M.S. BALBOA. BUENOS AIRES. CANADA. Axel Axelson Johnson. Length, 426 ft.; Gross Tonnage, 5,455.



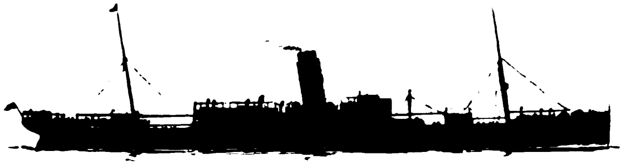
MONTEVIDEO. Compañia Trasatlantica. Length, 422 ft.; Gross Tonnage, 5,205; Funnel: Black.



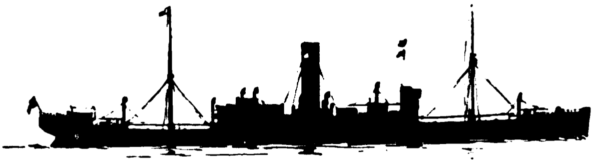
FRANCONIA. LACONIA. SAMARIA. SCYTHIA. Cunard. Length, 600 ft.; Gross Tonnage, 20,158; Funnels: Red, Black Top.



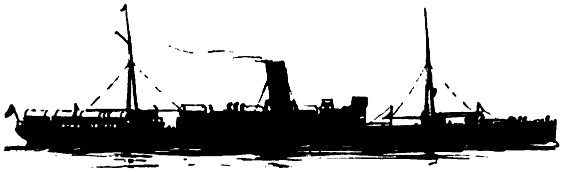
TYRRHENIA. Cunard. Length, 578 ft.; Gross Tonnage, 16,700; Funnel: Red, Black Top.



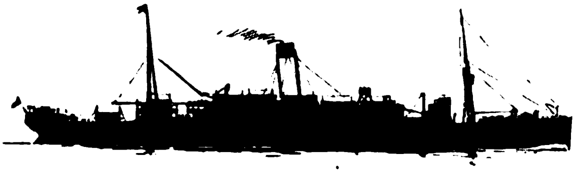
EURIPIDES. Aberdeen Line. Length. 570 ft; Gross Tonnage, 15,000; Funnel: Ochre.



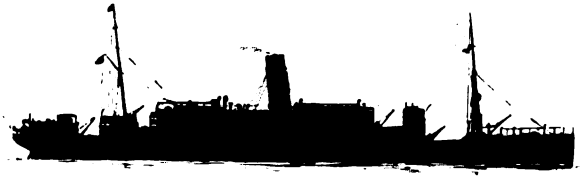
NESTOR. ULYSSES. Blue Funnel Line. Length, 563 ft. 2 ins.; Gross Tonnage, 14,547; Funnel: Blue, Black Top.



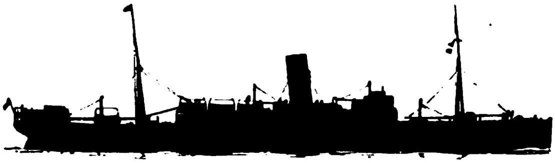
NOORDAM. RIJNDAM. Holland Amerika. Length, 560 ft. ; Gross Tonnage, 12,529 ; Funnel : Buff, White Band between Two Green.



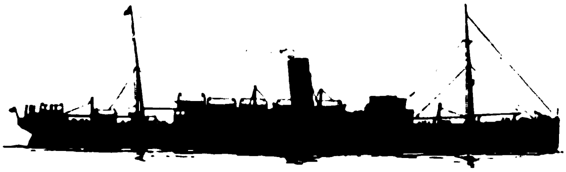
MEGANTIC. White Star. Length. 550 ft. 4 ins. ; Gross Tonnage, 14,878 ; Funnel : Buff, Black Top.



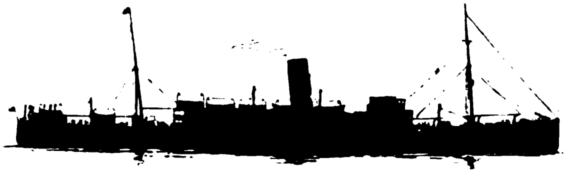
ALMANZORA. Royal Mail Steam Packet Co. Length, 550 ft. 3 ins. ; Gross Tonnage, 16,034 ; Funnel : Buff.



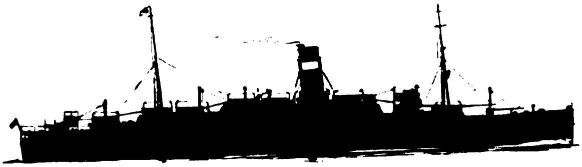
ORDUNA. Royal Mail Steam Packet Co. Length, 550 ft. 3 ins. ; Gross Tonnage, 15,499 ; Funnel : Buff.



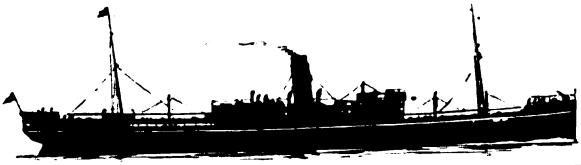
ORBITA. Royal Mail Steam Packet Co. Length, 550 ft. 3 ins. ; Gross Tonnage, 15,486 ; Funnel : Buff.



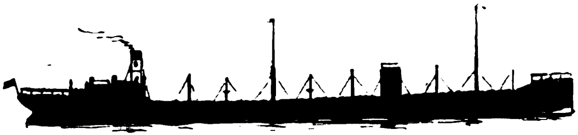
ORCA. Royal Mail Steam Packet Co. Length, 550 ft. ; Gross Tonnage, 16,063 ; Funnel : Buff.



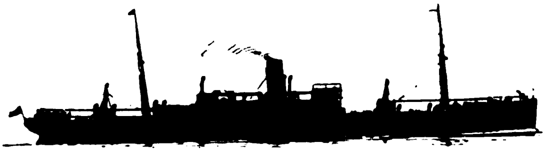
TRANSYLVANIA. Anchor Line. Length, 550 ft.; Gross Tonnage, 17,250; Funnel: Black, White Band, Black Top.



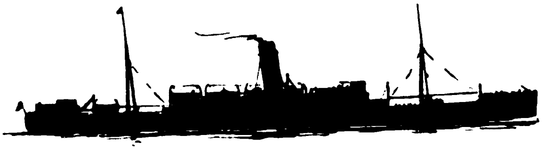
MOLDAVIA. Peninsular and Oriental. Length, 550 ft.; Gross Tonnage, 15,800; Funnel: Black.



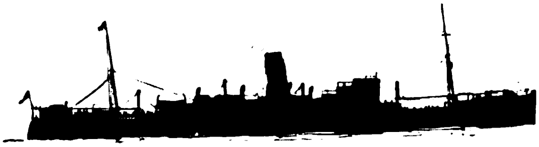
BETHORE. Ore Steamship Co., N.Y. Length, 550 ft.; Gross Tonnage, 14,890; Funnel: Grey, Blue and White Bands, White O.



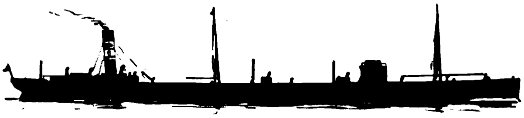
ESPERANCE BAY. HOBSONS BAY. JERVIS BAY. LARGS BAY. MORETON BAY. Commonwealth Government Line. Length, 548 ft.; Gross Tonnage, 16,500; Funnels: Yellow.



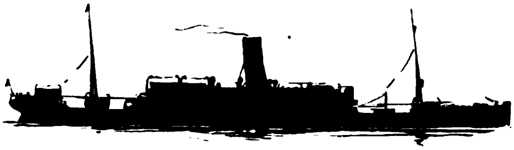
OROYA. Pacific Steam Navigation Co. Length, 547 ft.; Gross Tonnage, 14,000; Funnel: Buff.



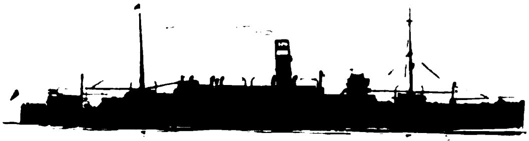
OROPESA. Pacific Steam Navigation Co. Length, 530 ft.; Gross Tonnage, 14,072; Funnel: Buff.



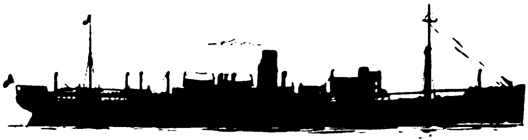
SAN FRATERNO. SAN GREGORIO. SAN JERONIMO. SAN LORENZO. SAN MELITO SAN NAZARIO. SAN PATRICIO. Eagle Oil Transport Co.
Length, 527 ft. 3 ins. ; Gross Tonnage. 11,929 ;
Funnel : Black, Yellow Band, Black Eagle, Black O on White Band, Yellow Band.



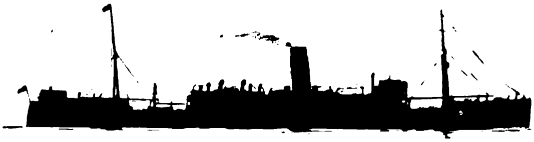
MARLOCK. Canadian Pacific. Length, 520 ft. ; Gross Tonnage, 10,600 ;
Funnel : Yellow.



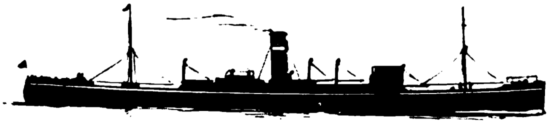
ATHENIA. Anchor (Donaldson). Length, 520 ft. ; Gross Tonnage, 12,000 ;
Funnel : Black, White Band, Black Top.



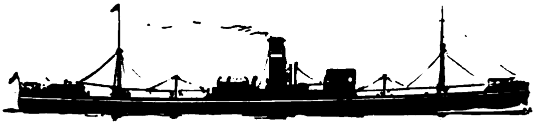
BARADINE. Peninsular and Oriental. Length, 519 ft. 9 ins. ; Gross Tonnage, 13,300 ;
Funnel : Black.



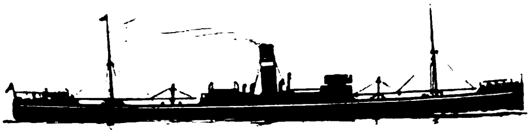
DIOGENES. SOPHOCLES. Aberdeen Line. Length, 518 ft. ; Gross Tonnage, 12,500 ;
Funnel : Ochre.



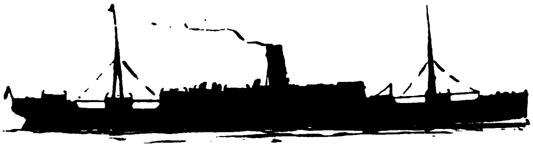
MANGALORE. MATHURA. Anchor Brocklebank. Length, 518 ft. Gross Tonnage, 9,751 ;
Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



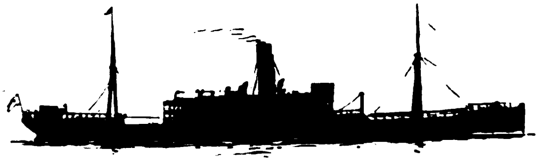
MALANCHA. **Anchor Brocklebank.** Length, 518 ft. ; Gross Tonnage, 10,572 ; Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



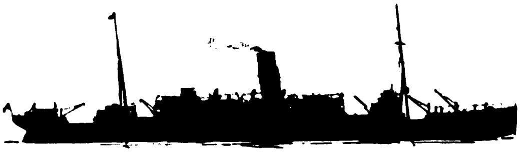
MACHARDA. **Anchor Brocklebank.** Length, 518 ft. ; Gross Tonnage, 10,464 ; Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



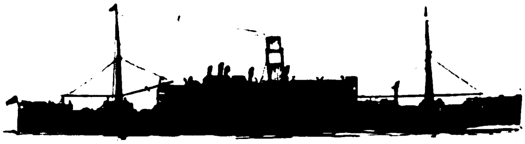
DROTTNINGHOLM. **Sverige-Norde-Amerika.** Length, 517 ft. ; Gross Tonnage, 12,522 ; Funnel : Yellow, Blue Disc, Three Gold Crowns.



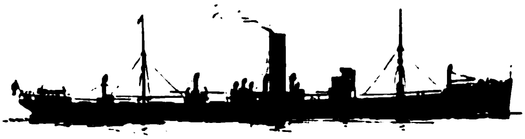
FUSHIMI MARU. SUWA MARU. **Nippon Yusen Kaisha.** Length, 516 ft. ; Gross Tonnage, 10,938 ; Funnel : Black.



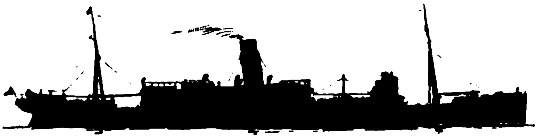
ARAQUAYA. **Royal Mail Steam Packet Co.** Length, 515 ft. 2 ins. ; Gross Tonnage, 10,530 ; Funnel : Buff.



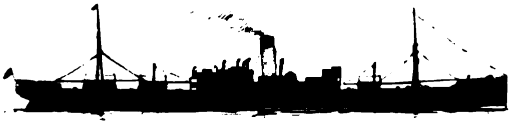
VANDYCK. **Lamport and Holt.** Length, 510 ft. ; Gross Tonnage, 13,233 ; Funnel : Blue, White Band, Black Top.



ACHILLES. PHILOCTETES. TYNDAREUS. Blue Funnel Line. Length, 507 ft.; Gross Tonnage, 11,426; Funnel: Blue, Black Top.

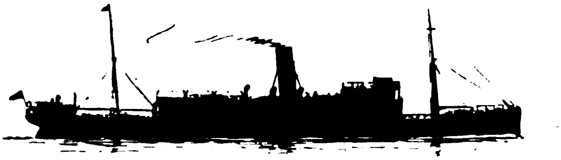


DEMOSTHENES. THEMISTOCLES. Aberdeen Line. Length, 506 ft. 6 ins.; Gross Tonnage, 11,223; Funnel: Ochre.

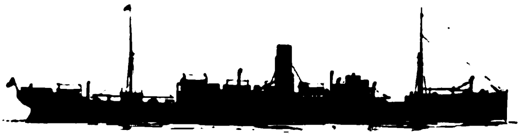


PORT MELBOURNE. PORT NAPIER. PORT SYDNEY. Commonwealth and Dominion Line. Length, 501 ft. 3 ins.; Gross Tonnage, 9,152; Funnel: Red, Black Top.

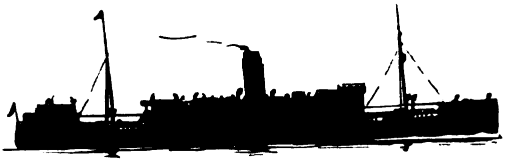
DARRO. DEMERARA. DESEADO. DESNA. Royal Mail Steam Packet Co. Length, 500 ft. 7 ins.; Gross Tonnage, 11,477; Funnel: Buff.



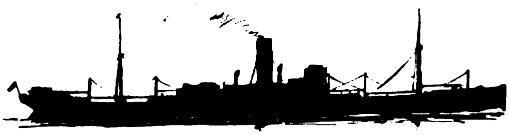
LLANSTEPHAN CASTLE. Union Castle Line. Length, 500 ft. 5 ins.; Gross Tonnage, 11,293; Funnel: Red, Black Top.



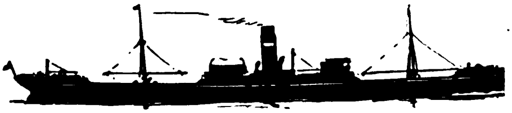
BELTANA. BENALLA. BERRIMA. BORDA. Peninsular and Oriental. Length, 500 ft.; Gross Tonnage, 11,120; Funnel: Black.



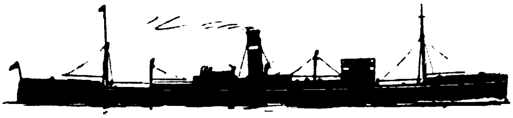
ALFONSO XIII. CRISTOBOL COLON. Compañia Trasatlantica. Length, 500 ft.; Gross Tonnage, 10,322; Funnel: Black.



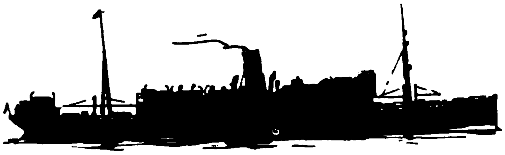
GLENIFFER. Glen Line. Length, 500 ft.; Gross Tonnage, 9,429; Funnel: Red, Black Top



MAIDAN. Anchor Brocklebank Line. Length, 500 ft. Gross Tonnage, 8,205; Funnel: Black, White Band, Blue and White Stripe Band, Black Top.

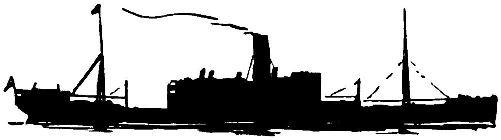


MAGDAPUR. MANIPUR. Anchor Brocklebank Line. Length, 499 ft. 6 ins.; Gross Tonnage, 9,237; Funnel: Black, White Band, Blue and White Stripe Band, Black Top.

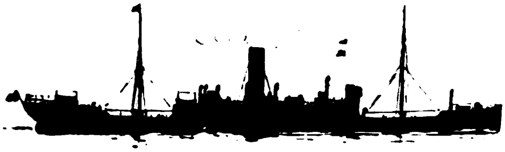


INFANTA ISABEL DE BORBON. Compañia Trasatlantica. Length, 498 ft.; Gross Tonnage, 10,348; Funnel: Black.

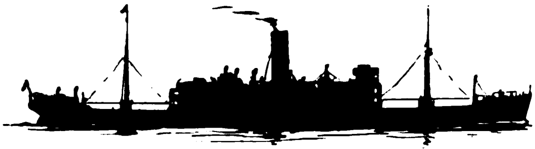
REINA VICTORIA EUGENIA. Compañia Trasatlantica. Length, 498 ft.; Gross Tonnage, 10,137; Funnel: Black.



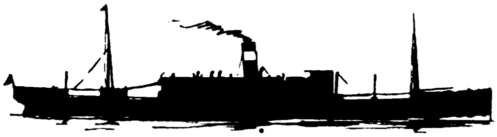
HAKONE MARU. HAKOZAKI MARU HARUNA MARU. Nippon Yusen Kaisha.
Length, 495 ft. ; Gross Tonnage, 10,420 ;
Funnel : Black.



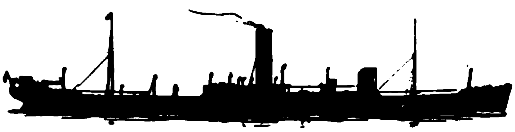
AENEAS. ANCHISES. ASCANUS. Blue Funnel Line. Length, 493 ft. ; Gross Tonnage, 10,049;
Funnel : Blue, Black Top.



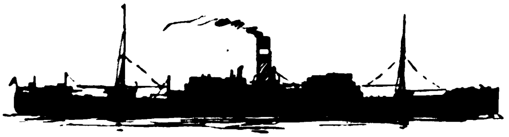
SARPEDON. Blue Funnel Line. Length, 491 ft. ; Gross Tonnage, 11,400 ;
DARDANUS. ,, ,, Length, 459 ft. ; Gross Tonnage, 7,900 ;
Funnel : Blue, Black Top.



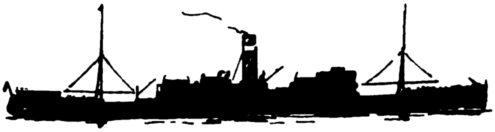
CAXIAS. Lloyd Brasileiro, Cie. de Nav. Length, 491 ft. ; Gross Tonnage, 9,791 ;
Funnel : Yellow, White Band.



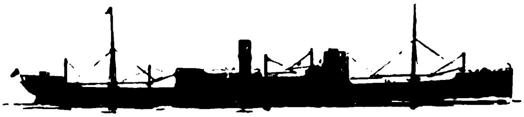
CALCHAS. Blue Funnel Line. Length, 490 ft. 8 ins. ; Gross Tonnage, 10,304 ;
Funnel : Blue, Black Top.



CITY OF NAGPUR. **Ellerman City Line.** Length, 490 ft.; Gross Tonnage, 10,138; Funnel: Buff, White Band, Black Top.



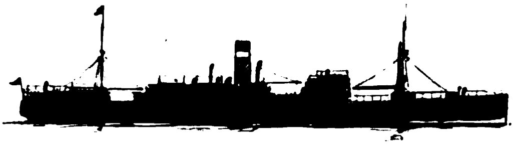
CITY OF EXETER. **Ellerman City Line.** Length, 486 ft. 7 ins.; Gross Tonnage, 9,447; Funnel: Buff, White Band, Black Top.



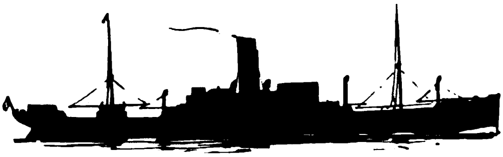
GLENBEG. GLENGARRY. GLENAPP. GLENOGLE. **Glen Line.** Length, 485 ft.; Gross Tonnage, 6,802; Funnel: Red, Black Top.

DINTELDYK. **Holland Amerika.** Length, 485 ft.; Gross Tonnage, 8,400; Funnel: Buff, Two Blue Bands, White between, Buff Top.

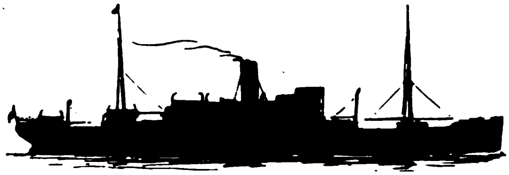
M.S. LOCHKATRINE. **Royal Mail Steam Packet Co.** Length, 485 ft.; Gross Tonnage, 9,409; Funnel: Buff.



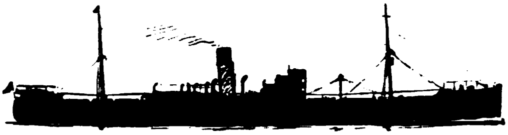
CITY OF PARIS. **Ellerman City Line.** Length, 484 ft. 7 ins.; Gross Tonnage, 10,245; Funnel: Buff, White Band, Black Top.



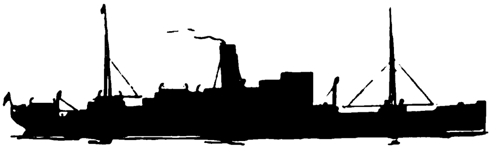
CEYLAN. MALTE. QUISSANTE. **Chargeurs Reunis.** Length, 483 ft.; Gross Tonnage, 9,000; Funnel: Yellow, Red Stars on White Band.



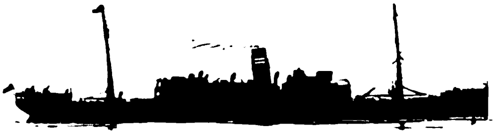
FORMOSE
GROIX. } **Chargeurs Reunis.** Length, 481 ft. 6 ins.; Gross Tonnage, 10,500;
HOODIC
BELLE ISLE. ,, ,, ,, ,, ,, ,, 9,591;
AURIGNY. ,, ,, ,, ,, ,, ,, 9,589;
DESIRADE
EUBEE } ,, ,, ,, ,, ,, ,, 9,580;
Funnel: Yellow, Red Stars on White Band.



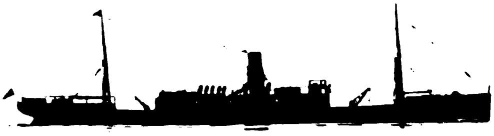
PORT ADELAIDE. PORT AUCKLAND. PORT BOWEN. PORT CAMPBELL. PORT CAROLINE. PORT DARWIN. PORT DENISON. PORT HUNTER. PORT KEMBLA. PORT NICHOLSON. Commonwealth and Dominion Line. Length, 481 ft. 2 ins; Gross Tonnage, 8,422; Funnel: Red, Black Top.



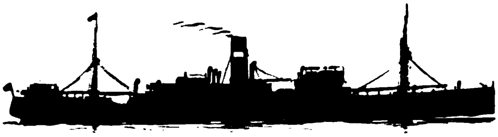
MEDUANA. MOSELLA. Cie. Sud Atlantique. Length, 481 ft.; Gross Tonnage, 10,500; Funnel: Yellow, Black Top.



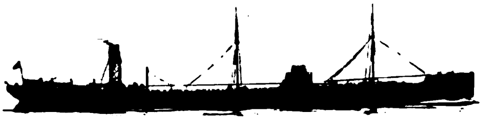
NEURALIA. NEVASA. British India S.N. Co. Length, 480 ft. 5 ins.; Gross Tonnage, 9,082; Funnel: Black, Two White Bands, Black Top.



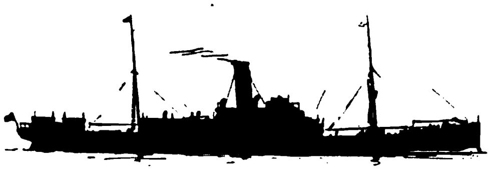
KASHGAR. KASHMIR. Peninsular and Oriental. Length, 479 ft. 9 ins.; Gross Tonnage, 8,840; Funnel: Black.



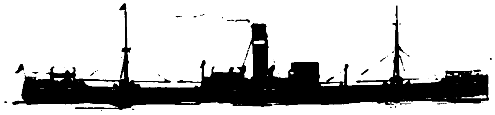
CITY OF SIMLA. **Ellerman City Line.** Length, 476 ft. 7 ins.; Gross Tonnage, 9,468;
Funnel: Buff, White Band, Black Top.



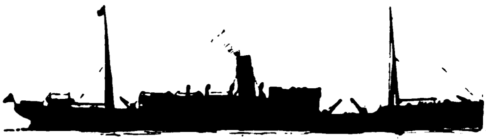
IROQUOIS. **Anglo American Oil Co.** Length, 476 ft. 3 ins.; Gross Tonnage, 9,202;
Funnel: Red, Black Top.



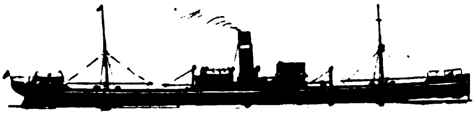
DUNLUCE CASTLE. DURHAM CASTLE. Union Castle
Length, 475 ft. 5 ins.; Gross Tonnage, 8,130;
Funnel: Red, Black Top.



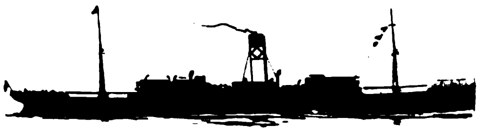
MAHSUD. MAIHAR. MALAKAND. MANAAR. MATHERAN. Anchor Brocklebank.
Length, 470 ft. 4 ins.; Gross Tonnage, 8,077;
Funnel: Black, White Band, Blue and White Stripe Band, Black Top.



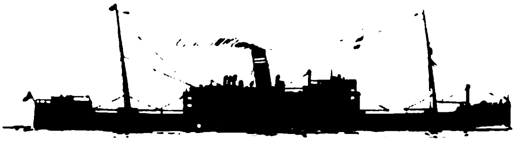
DELTA. DEVANHA. DONGOLA. Peninsular and Oriental.
Length, 470 ft. 3 ins.; Gross Tonnage, 8,097;
Funnel: Black.



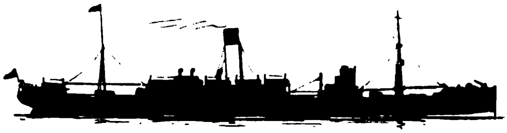
MALAKUTA. **Anchor Brocklebank.** Length, 470 ft. 2 ins.; Gross Tonnage, 7,205;
Funnel: Black, White Band, Blue and White Stripe Band, Black Top.



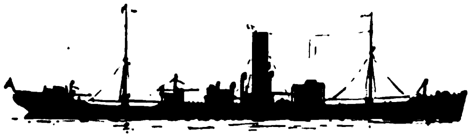
CALAMARES. **United Fruit Carriers.** Length, 470 ft. ; Gross Tonnage, 7,782 ;
PASTORES „ „ „ Length, 470 ft. ; Gross Tonnage, 7,242;
Funnel : Buff, White Diamond on Red Band, Black Top.



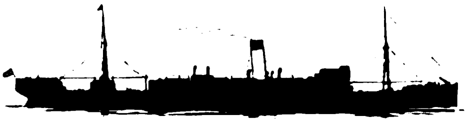
MADURA. MALDA. MANTOLA. MATIANA. British India S.N. Co. Length, 465 ft. 2 ins. ;
Gross Tonnage, 8,975;
Funnel : Black, Two White Bands, Black Top.



ARAWA. TAINUI. Shaw, Savill, and Albion Co. Length, 460 ft. ; Gross Tonnage, 9,372 ;
Funnel : Buff, Black Top.

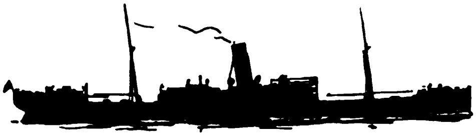


AGAPENOR. ELPENOR. EUMAEUS. GLAUCUS. HELENUS. LYCAON. MACHAON.
MENTOR. PHEMUS. PYRRHUS. TEIRESIAS. TROILUS. Blue Funnel Line.
Length, 455 ft. 2 ins. ; Gross Tonnage, 7,587 ;
Funnel : Blue, Black Top.

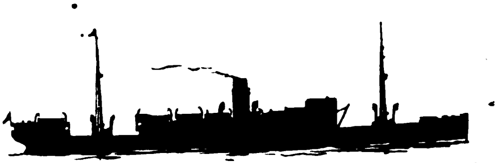


KONINGEN DER NEDERLANDEN. Stoomvaart Maatschappy.
Length, 455 ft. ; Gross Tonnage, 8,300 ;
Funnel : Buff, Black Top.

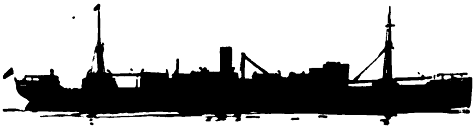
CLAN MACTAGGART. Clan Line. Length, 452 ft. 7 ins. ; Gross Tonnage, 7,602 .
CLAN MACTAVISH. „ „ Length, 469 ft. ; Gross Tonnage, 7,619 ;
Funnel : Black, two Red Bands.



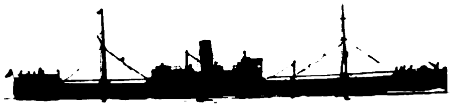
GARTH CASTLE. GRANTULLY CASTLE. Union Castle.
Length, 452 ft. 6 ins ; Gross Tonnage, 7,715 ;
Funnel: Red, Black Top.



MANUEL ARNUS. Compañia Trasatlantica. Length, 451 ft. 6 ins. ; Gross Tonnage, 7,578 ;
Funnel : Black.

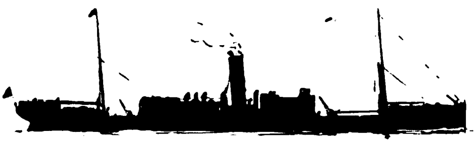


M.S. ABA. M.S. ADDA. Elder Dempster. Length, 450 ft. 3 ins. ; Gross Tonnage, 7,938 ;
Funnel : Buff.

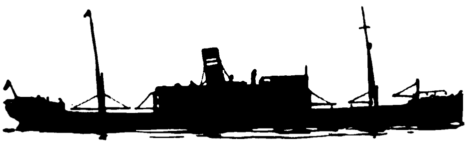


M.S. DORSETSHIRE. M.S. SOMERSETSHIRE. Bibby Line.
Length, 450 ft. 3 ins. ; Gross Tonnage, 7,500 ;
Funnel : Salmon Pink, Black Top.

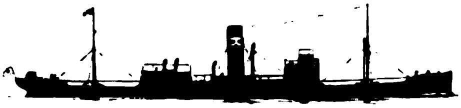
PLASSY. Peninsular and Oriental. Length, 450 ft. 3 ins. ; Gross Tonnage, 7,393 ;
Funnel : Black.



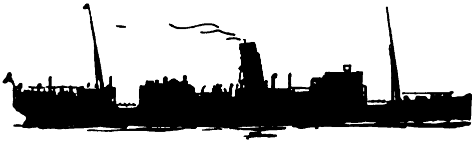
SARDINIA. SICILIA. SOMALI. SOUDAN. SYRIA. Peninsular and Oriental.
Length, 450 ft. 2 ins. ; Gross Tonnage, 6,684 ;
Funnel : Black.



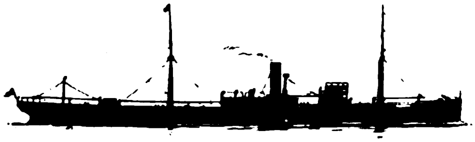
M.S. DOMALA, British India S.N. Co. Length, 450 ft. ; Gross Tonnage, 8,441 ;
Funnel : Black, Two White Bands, Black Top.



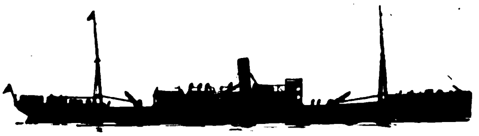
LONDON MARU. PARIS MARU. Osaka Shosen Kaisha. Length, 450 ft. ; Gross Tonnage, 7,600 ;
Funnel : Black, Japanese Flag on Side.



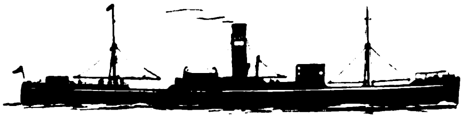
MAKURA. Union Steam Ship Co. of N.Z. Length, 456 ft. ; Gross Tonnage, 8,075 ;
Funnel : Red, Black Top.



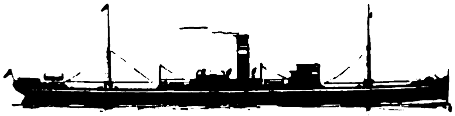
BAKARA. BARAMBAH. BOONAH. Australian Commonwealth Line.
Length, 450 ft. ; Gross Tonnage, 5,970 ;
Funnel : Black.



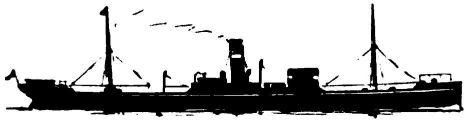
NANKIN. NOVARA. Peninsular and Oriental. Length, 449 ft. 7 ins. ; Gross Tonnage, 7,058 ;
Funnel : Black.



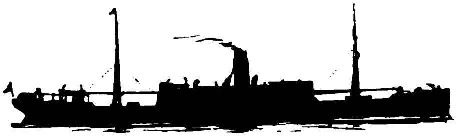
MASIRAH. Anchor Brocklebank Line. Length, 448 ft. ; Gross Tonnage, 6,836 ;
Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



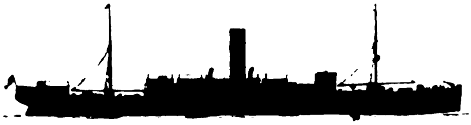
ANCHORIA. Anchor Brocklebank Line. Length, 446 ft. 4 ins. ; Gross Tonnage, 6,112 ;
Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



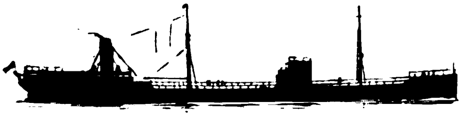
MAHRATTA. MAKALLA. Anchor Brocklebank Line. Length, 445 ft. ; Gross Tonnage, 6,690
Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



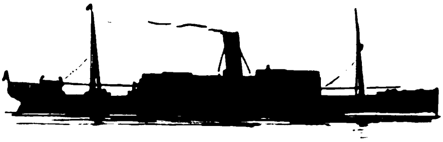
ANTONIO LOPEZ. Compañia Trasatlantica. Length, 440 ft.; Gross Tonnage, 5,975; Funnel: Black.



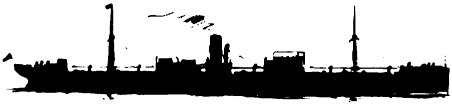
HILDEBRAND. Booth Line. Length, 440 ft. 3 ins.; Gross Tonnage, 6,995; Funnel: Black.



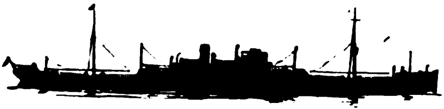
BRITISH MERCHANT. British Tanker Co. Length, 440 ft.; Gross Tonnage, 7,400; Funnel: Black, Two Red Bands, White Disc, B.T.C. in centre.



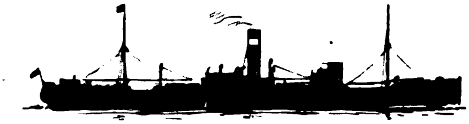
ZEELANDIA. Koninklijke Hollandsch Lloyd. Length, 440 ft.; Gross Tonnage, 7,995; Funnel: Yellow, Black Band.



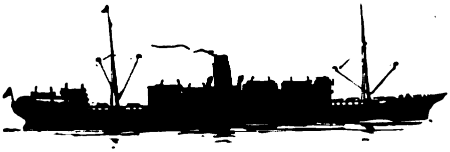
CLAN COLQUHOUN. CLAN URQUHART. Clan Line. Length, 440 ft.; Gross Tonnage, 5,856; Funnel: Black, Two Red Bands.



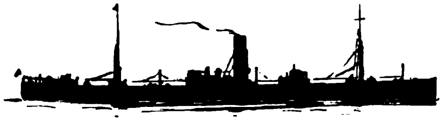
M.S. GLENAMOY. Glen Line. Length, 435 ft.; Gross Tonnage, 7,269; Funnel: Red, Black Top.



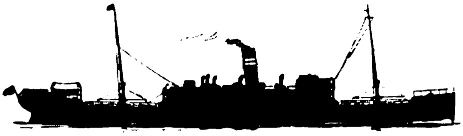
CITY OF NORWICH. **Ellerman (Hall Line).** Length, 434 ft. 4 ins. ; Gross Tonnage, 6,726 ; Funnel : Buff, White Band, Black Top.



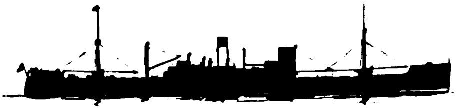
REINA MARIA CRISTINA. **Compañia Trasatlantica.** Length, 534 ft. ; Gross Tonnage, 4,817 ; Funnel : Black.



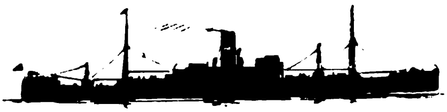
NAGINA. **British India Steam Navigation Co.** Length, 433 ft. ; Gross Tonnage, 6,650 ; Funnel : Black, Two White Bands.



TAKADA. **TANDA.** **British India S.N.Co.** Length, 430 ft. 1 in. ; Gross Tonnage, 6,949 ; Funnel : Black, Two White Bands, Black Top.



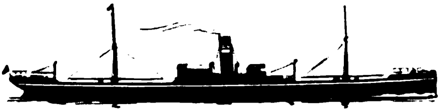
M.S. LEIGHTON. **M.S. LINNELL.** **Lamport and Holt.** Length, 430 ft. ; Gross Tonnage, 7,412 ; Funnel : Light Blue, White Band, Black Top.



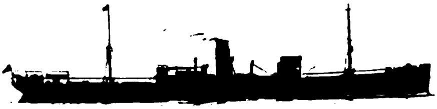
HARDWICKE GRANGE. **Furness Withy (Houlder).** Length, 430 ft. ; Gross Tonnage, 9,005 ; Funnel : Black, Red Band with White Maltese Cross, Black Top.

MARQUESA. **Furness (Houlder).** Length, 430 ft. ; Gross Tonnage, 8,979 ; Funnel : Black, Red Band with White Maltese Cross, Black Top.

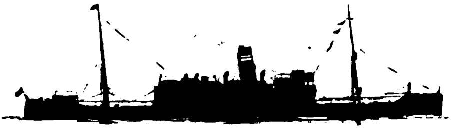
BAYANO. CAMITO. CORONADO. Elders and Fyffes.
Length, 425 ft. 5 ins.; Gross Tonnage, 6,788;
Funnel: Buff, Black Top.



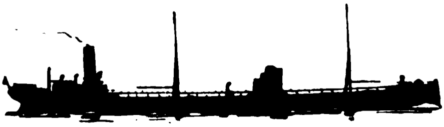
STOCKWELL. Anchor Brocklebank Line. Length, 425 ft.; Gross Tonnage, 5,643;
Funnel: Black, White Band, Blue and White Stripe Band, Black Top.



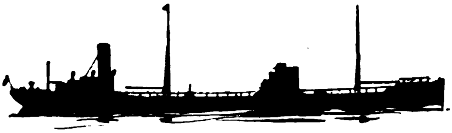
CAIRNROSS. Cairns, Noble & Co. Length, 425 ft.; Gross Tonnage, 5,494;
Funnel: Black, Red Band, White Triangle.



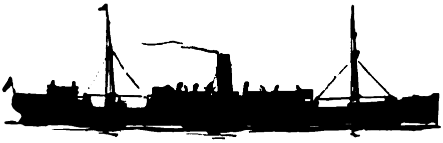
KARAGOLA. British India S.N. Co. Length, 425 ft.; Gross Tonnage, 7,053;
Funnel: Black, Two White Bands, Black Top.



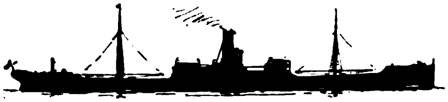
TUSCARORA. Anglo American Oil Co. Length, 425 ft.; Gross Tonnage, 7,106;
Funnel: Red, Black Top.



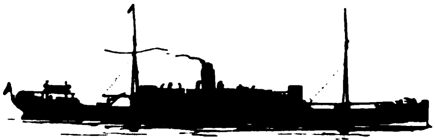
M.S. NARRAGANSETT. M.S. SEMINOLE. Anglo American Oil Co.
Length, 425 ft.; Gross Tonnage, 6,889;
Funnel: Red, Black Top.



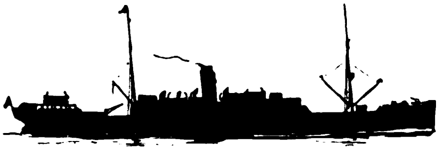
BUENOS AIRES. Compañia Trasatlantica. Length, 422 ft; Gross Tonnage, 5,311;
Funnel: Black.



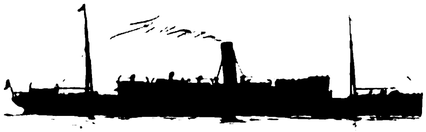
DONGARRA. Commonwealth Government Line. Length, 422 ft. ; Gross Tonnage, 5,601 ; Funnel : Black.



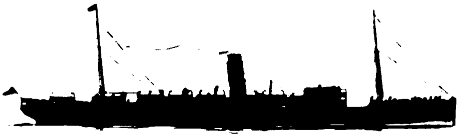
LEON XIII. Compañia Trasatlantica. Length, 421 ft. ; Gross Tonnage, 5,086 ; Funnel : Black.



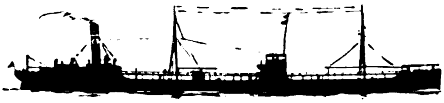
P. DE SATRUSTEGUI. Compañia Trasatlantica. Length, 421 ft. 10 ins. ; Gross Tonnage, 4,670 ; Funnel : Black.



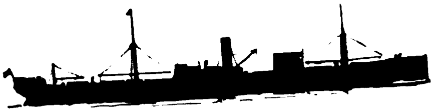
KAROOLA. McIlwraith, McEacharn. Length, 420 ft. 5 ins. ; Gross Tonnage, 7,391 ; Funnel : Red, Black Top.



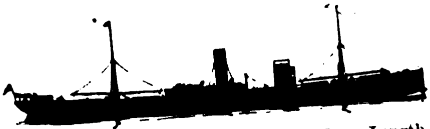
MARAMA. Union Steamship Co. of N.Z. Length, 420 ft. 3 ins. ; Gross Tonnage, 6,497 ; Funnel : Red, Black Top.



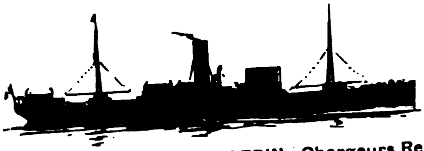
SAN DUNSTANO. SAN EDUARDO. SAN RICARDO. SAN SILVESTRE. SAN TIRSO. SAN VALERIO. SAN ZEFERINO. Eagle Oil Transport Co., Ltd. Length, 420 ft. 2 ins. ; Gross Tonnage, 6,220 ; Funnel : Black, Yellow Band, Black Eagle, Black O on White Band, Yellow Band.



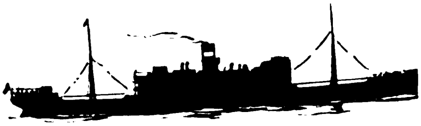
M.S. DOMINION MILLER. Furness Withy. Length, 420 ft.; Gross Tonnage, 5,070 ;
Funnel: Black, Red Band, Black Band, Black Top.



CAIRNVALONA. Cairns, Noble & Co. Length, 415 ft. 2 ins.; Gross Tonnage, 4,929 ;
Funnel: Black, Red Band, White Triangle.

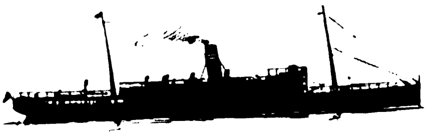


D'ENTRECASTEAUX. FORBIN. Chargeurs Reunis. Length, 415 ft.; Gross Tonnage, 7,563 ; 7,418 ;
DUPLEIX. " " " " " 7,393 ;
ANGO. " " " 413 ft. ; " 7,293 ;
BOUGAINVILLE. " " "
Funnel: Yellow, Red Stars on White Band.

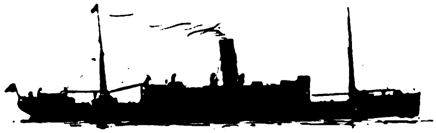


MUNARGO. Munson Steamship Co. Length, 415 ft.; Gross Tonnage, 6484 ;
Funnel: Blue, White Band, Black Top.

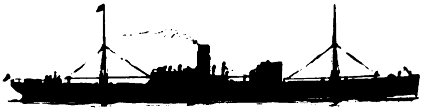
FORT ST. GEORGE. FORT VICTORIA. Furness Withy. Length, 411 ft. 3 ins.;
Gross Tonnage, 7,785 ;
Funnel: Black, Red, Thin Black and Red Bands, Black Top.



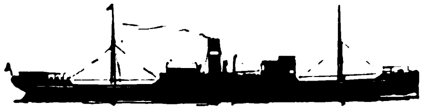
ERINPURA. British India S.N. Co. Length, 411 ft.; Gross Tonnage, 5,128 ;
Funnel: Black, Two White Bands, Black Top.



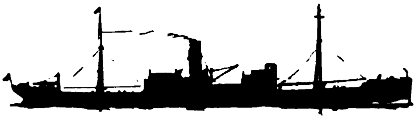
ZEALANDIA. Huddart, Parker. Length, 410 ft.; Gross Tonnage, 7,000; Funnel: Yellow.



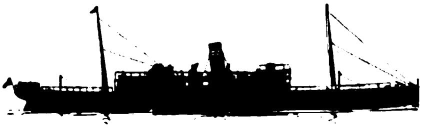
CLAN MACNAB. CLAN MACNAIR. CLAN MACNAUGHTON. CLAN MACNEIL. CLAN MONROE. CLAN MORRISON. CLAN MURDOCH. CLAN MURRAY. Clan Line. Length, 410 ft. 6 ins.; Gross Tonnage, 6,114; Funnel: Black, Two Red Bands.



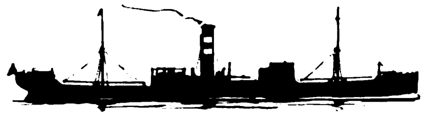
MEDIA. Anchor Brocklebank. Length, 410 ft.; Gross Tonnage, 5,437; Funnel: Black, White Band, Blue and White Stripe Band, Black Top.



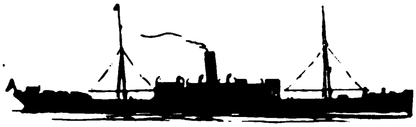
OCEAN PRINCE. Furness Withy. Length, 410 ft.; Gross Tonnage, 5,212; Funnel: Black, Red, Thin Black and Red Bands, Black Top.



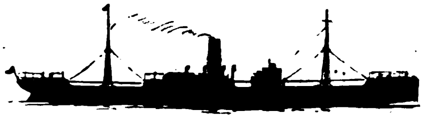
ELLENGA. British India S.N. Co. Length, 410 ft.; Gross Tonnage, 5,196; Funnel: Black, Two White Bands, Black Top.



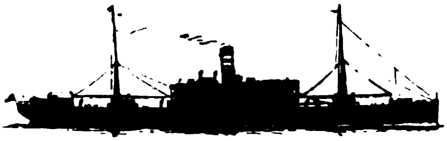
DRAMATIST. Harrison Line. Length, 410 ft.; Gross Tonnage, 5,443; Funnel: Black, Red Band between Two White.



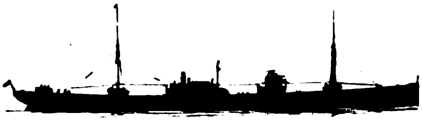
C. LOPEZ Y LOPEZ. Compañia Trasatlantica. Length, 408 ft.; Gross Tonnage, 4,170; Funnel: Black.



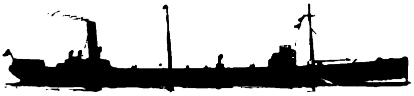
EBOE. Elder Dempster. Length, 405 ft. 1 in.; Gross Tonnage, 4,866;
Funnel: Buff.



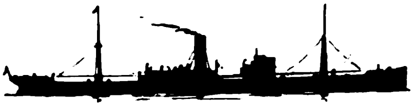
HIGHLAND LADDIE. Nelson. Length, 405 ft.; Gross Tonnage, 7,381;
HIGHLAND LOCH. „ Length, 413 ft.; Gross Tonnage, 7,493;
HIGHLAND PIPER. „ Length, 413 ft.; Gross Tonnage, 7,490;
Funnel: Red, Two White Bands, Black Between, Black Top.



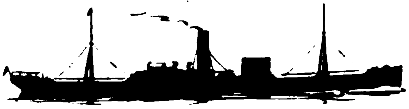
M.S. LOUISIANA. Det Forenede Dampskibs Selskab. Length, 405 ft.; Gross Tonnage, 6,513;
Funnel: Flamingo, Red, Black Top.



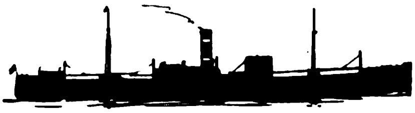
DAGHESTAN. Oil Tanker. Hindustan Steam Shipping Co. Length, 405 ft.;
Gross Tonnage, 5,742;
Funnel: Black, Two White Bands, Vermilion Between, C in White.



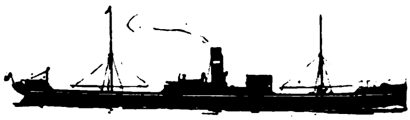
GLENLUCE. GLENTARA. Glen Line. Length, 405 ft.; Gross Tonnage, 6,755;
Funnel: Red, Black Top.



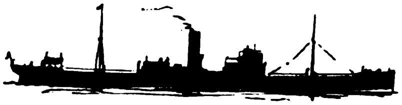
KALIMBA. ROMERA. Maclay and McIntyre. Length, 402 ft. 3 ins.; Gross Tonnage, 4892;
Funnel: Yellow, Black Top.



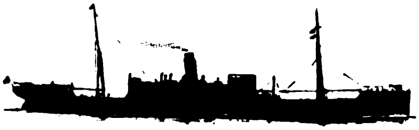
BREDA. BREILLA. Koninklijke Nederlandsche Stoomboot Mij. Length, 402 ft.;
Gross Tonnage, 6,915;
Funnel: Black, Two White Bands.



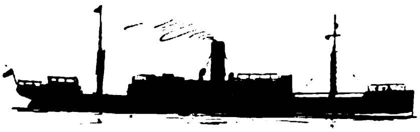
HOLYWELL. **Anchor Brocklebank.** Length, 401 ft. 8 ins. ; Gross Tonnage, 4,867 ;
Funnel : Black, White Band, Blue and White Stripe Band, Black Top.



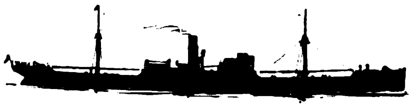
HALIZONES. **Houston Line.** Length, 400 ft. 8 ins. ; Gross Tonnage, 5,273 ;
Funnel : Red, Two Black Bands, Black Top.



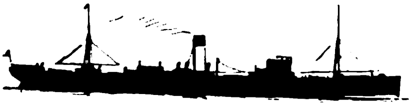
CHALEUR. **CHAUDIERE.** **CHIGNECTO.** **Royal Mail Steam Packet Co.**
Length, 400 ft. 5 ins. ; Gross Tonnage, 4,890 ;
Funnel : Buff.



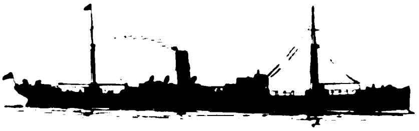
ABINSI. **Elder Dempster.** Length, 400 ft. 5 ins. ; Gross Tonnage, 6,365 ;
Funnel : Buff.



ARIANO. **Gulf Line.** Length, 400 ft. 4 ins. ; Gross Tonnage, 5,155 ;
Funnel : Black, Wide Red Band, Narrow Red Band Below.

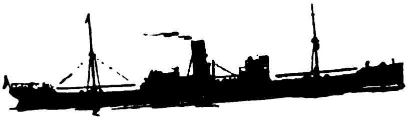


NORWEGIAN. **Leyland Line.** Length, 400 ft. 2 ins. ; Gross Tonnage, 6,357 ;
Funnel : Buff, Black Top.

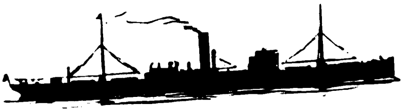


MANISTEE. **PATIA.** **ZENT.'** **Elders and Fyffes.** Length, 400 ft. 2 ins. ; Gross Tonnage, 5,360 ;
Funnel : Buff, Black Top.

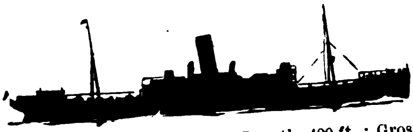
EDAVANA, ELEPHANTA. **British India S.N. Co.** Length, 400 ft. ; Gross Tonnage, 5,284 ;
Funnel : Black, Two White Bands, Black Top.



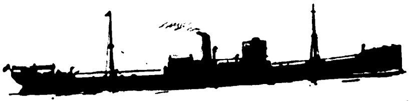
CANADIAN VICTOR. **Canadian Government Merchant Marine.** Length, 400 ft.; Gross Tonnage, 5,493;
Funnel: Yellow, Black Top.



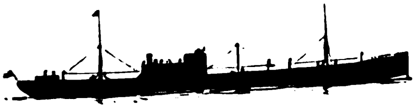
MIN. **Edwd. Hain & Son, Ltd.** Length, 400 ft,; Gross Tonnage, 4,700;
Funnel: Black, White "H" on side.



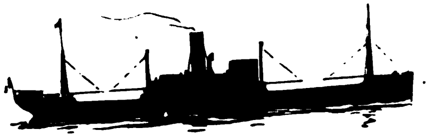
ANSELM. **Booth Line.** Length, 400 ft.; Gross Tonnage, 5,450;
Funnel: Black.



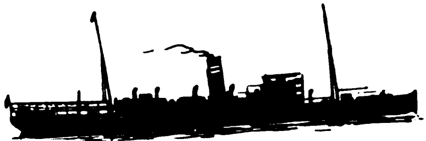
CAIRNDHU. **Cairns, Noble & Co.** Length, 399 ft. 3 ins.; Gross Tonnage, 5,250;
CAIRNGOWAN. " " Length, 400 ft.; Gross Tonnage, 5,295;
Funnel: Black, Red Band, White Triangle.



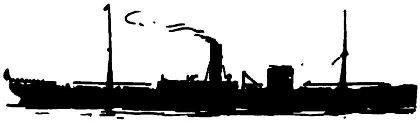
M.S. LULE. **Grängesberg Oxelösund Co.** Length, 399 ft.; Gross Tonnage, 5,630;
Funnel: Buff, Blue Band, Gold Emblem.



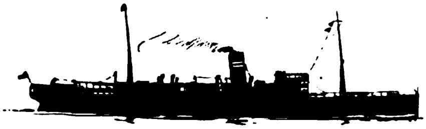
BAOULE.
CASAMANCE. } **Chargeurs Reunis.** Length, 391 ft.; Gross Tonnage, 5,900;
DAHOMEY. " " " " " " 5,355;
ADRAR.
Funnel: Yellow, Red Stars on White Band.



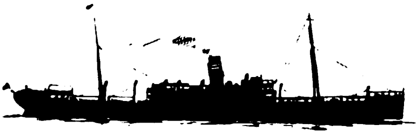
ANGORA. **British India S.N. Co.** Length, 390 ft. 8 ins.; Gross Tonnage, 4,298;
Funnel: Black, Two White Bands, Black Top.



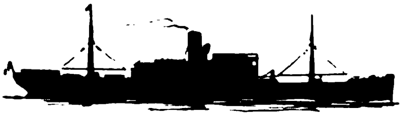
CAIRNMONA. **Cairns, Noble & Co.** Length, 390 ft. 2 ins. ; Gross Tonnage, 4,666 ;
Funnel : Black, Red Band, White Triangle.



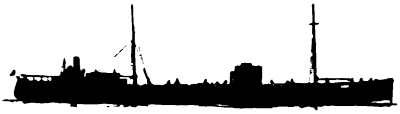
ARONDA. **British India S.N. Co.** Length, 390 ft. 2 ins. ; Gross Tonnage 4,062 ;
Funnel : Black, Two White Bands, Black Top.



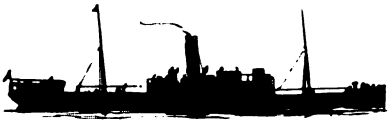
VARELA. **VARSOVA.** **VITA.** **British India S.N. Co.** Length, 390 ft. 1 in. ;
Gross Tonnage, 4,645 ;
Funnel : Black, Two White Bands, Black Top.



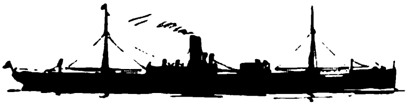
AMIRAL LATOUCHE. **AMIRAL NEILLY.** **AMIRAL PONTY.** **AMIRAL TREVILLE.**
Chargeurs Reunis. Length, 389 ft. 5 ins. ; Gross Tonnage, 5,582 ;
Funnel : Yellow, Red Stars on White Band.



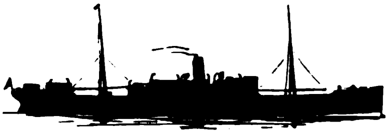
OLJAREN. **Transatlantic S.S. Co.** Length, 389 ft. ; Gross Tonnage, 5,450.



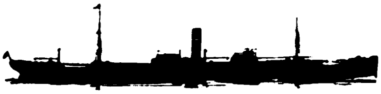
LEGAZPI. **Compañia Trasatlantica.** Length, 389 ft. ; Gross Tonnage, 4,330 ;
Funnel : Black.



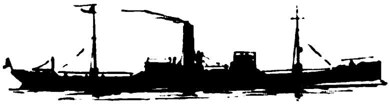
COOEE. Australian Commonwealth Line. Length, 387 ft. 8 ins.; Gross Tonnage, 4,255; Funnel: Black.



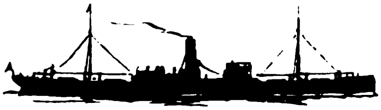
MONTSERRAT. Compañia Trasatlantica. Length, 386 ft. 1 in.; Gross Tonnage, 3,904; Funnel: Black.



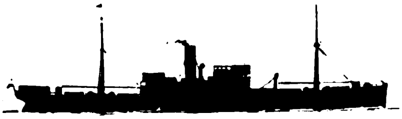
SCATWELL. Cairns, Noble & Co. Length, 385 ft.; Gross Tonnage, 4,425; Funnel: Black, Red Band, White Triangle.



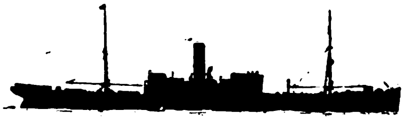
HALESIUS Houston Line. Length, 385 ft.; Gross Tonnage, 4,652; Funnel: Red, Two Black Bands, Black Top.



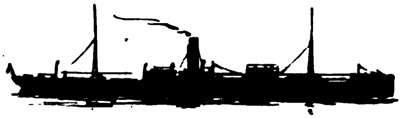
HESPERIDES. Houston Line. Length, 382 ft. 5 in.; Gross Tonnage, 3,914; Funnel: Red, Two Black Bands, Black Top.



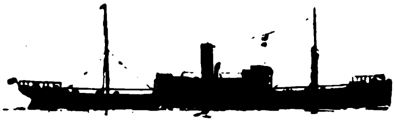
DENIS. STEPHEN. Booth Line. Length, 376 ft. 4 ins.; Gross Tonnage, 4,435; Funnel: Black.



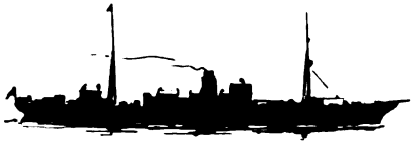
AIDAN. Booth Line. Length, 375 ft. 9 ins. ; Gross Tonnage, 4,545 ; Funnel : Black.



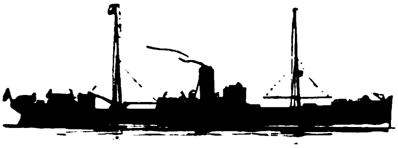
PARATTAH. Australian Commonwealth Line. Length, 375 ft. 6 ins. ; Gross Tonnage, 4,229 ; Funnel : Black.



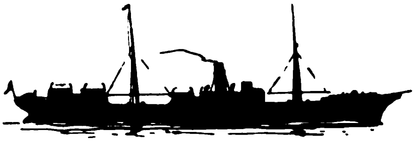
ALBAN. Booth Line. Length, 375 ft. 2 ins. ; Gross Tonnage, 5,223 ; Funnel : Black.



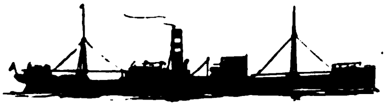
CUIDAD DE CADIZ. Compañia Trasatlantica. Length, 375 ft. ; Gross Tonnage, 3,202 ; Funnel : Black.



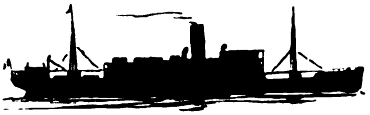
ISLA DE PANAY. Compañia Trasatlantica. Length, 373 ft. ; Gross Tonnage, 3,484 ; Funnel : Black.



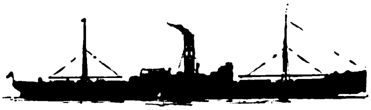
ALICANTE. Compañia Trasatlantica. Length, 372 ft. 2 ins ; Gross Tonnage, 3,879 ; Funnel : Black.



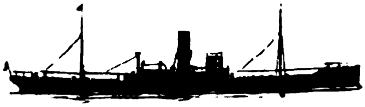
SPEAKER. **Harrison Line.** Length, 370 ft.; Gross Tonnage, 4,264; Funnel: Black, Red Band between Two White.



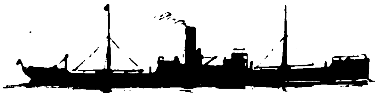
EUROPE. **Chargeurs Reunis.** Length, 369 ft.; Gross Tonnage, 5,453; Funnel: Yellow, Red Stars on White Band.



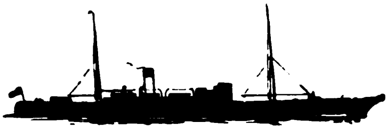
SANTA AURORA. **Eagle Oil Transport Co., Ltd.** Length, 367 ft. 5 ins.; Gross Tonnage, 4,278 Funnel: Black, Yellow Band, Black Eagle, Black O on White Band, Yellow Band.



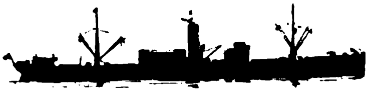
HESIONE. **Houston Line.** Length, 361 ft. 7 ins.; Gross Tonnage, 4,125; Funnel: Red, Black Top.



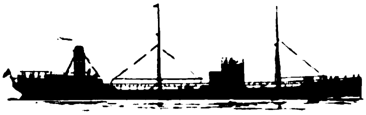
TOROMEO. **Australian Commonwealth Line.** Length, 360 ft.; Gross Tonnage, 4,149; Funnel: Black.



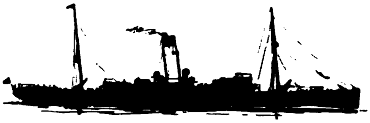
JOHN W. MACAY. **Commercial Cable Co., N.Y.** Length, 360 ft Gross Tonnage, 4,049; Funnel: Buff, Black Top.



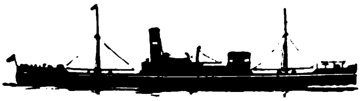
CUTHBERT. JUSTIN. Booth Line. Length, 355 ft. Gross Tonnage, 3,843 ;
Funnel : Black.



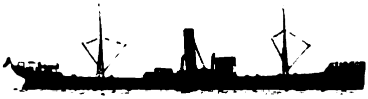
BRITISH COMMERCE. BRITISH ENTERPRISE. BRITISH TRADER. British Tanker Co.
Length, 351 ft. 4 ins. ; Gross Tonnage, 4,205 ;
Funnel : Black, Two Red Bands, White Disc, B.T.C. in centre.



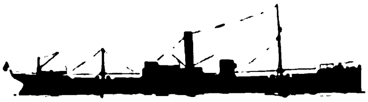
REGELE CAROL I. Roumanian State. Length, 350 ft. ; Gross Tonnage, 2,370 ;
Funnel : White, Black Top.



M.S. MALIA. Anchor Brocklebank. Length, 350 ft. 5 ins. ; Gross Tonnage, 3,872 ;
Funnel : Black, White Band, Blue and White Striped Band, Black Top.

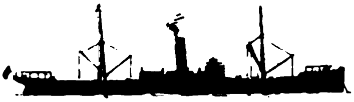


BENEDICT. Booth Line. Length, 345 ft. ; Gross Tonnage, 3,457 ;
Funnel : Black.

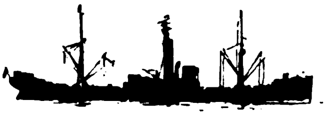


POLYCARP. Booth Line. Length, 340 ft. 7 ins. ; Gross Tonnage, 3,577 ;
Funnel ; Black.

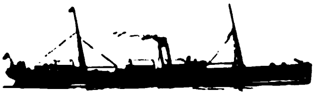
BARODA. British India S.N. Co. Length, 330 ft. 4 ins. ; Gross Tonnage, 3,172 ;
Funnel : Black, Two White Bands, Black Top.



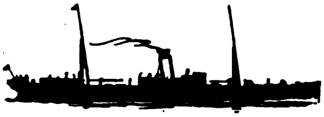
DOMINIC. DUNSTAN. Booth Line. Length, 322 ft. ; Gross Tonnage, 2,966 ;
Funnel : Black.



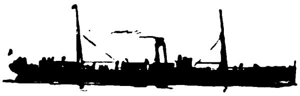
MICHAEL. **Booth Line.** Length, 300 ft. 5 ins.; Gross Tonnage, 3,172;
Funnel: Black.



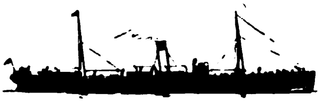
SLIEVEBAWN. **SLIEVEMORE.** **London, Midland and Scottish Railway.**
Length, 300 ft. 2 ins.; Gross Tonnage, 1,061;
Funnel: Yellow, Black Top.



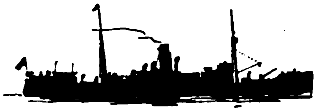
SLIEVE DONARD. **London, Midland and Scottish Railway.**
Length, 300 ft.; Gross Tonnage, 1,116;
Funnel: Yellow, Black Top.



SNOWDEN. **London, Midland and Scottish Railway.** Length, 299 ft. 9 ins.; Gross Tonnage, 1021;
SOUTH STACK. „ „ „ Length, 299 ft.; Gross Tonnage, 977;
Funnel: Yellow, Black Top.



SLIEVEGALLION. **London, Midland and Scottish Railway.**
Length, 299 ft. 5 ins.; Gross Tonnage, 1,071;
Funnel: Yellow, Black Top.



SAN CARLOS. **Compañia Trasatlantica.** Length, 291 ft.; Gross Tonnage, 2,491;
Funnel: Black.

PRINCESS ADELAIDE. **Canadian Pacific.** Length, 290 ft. 5 ins.; Gross Tonnage, 3,061;
Funnel: Yellow.

M.S. DUMRA. **British India S.N. Co.** Length, 280 ft.; Gross Tonnage, 2,000;
Funnel: Black, Two White Bands, Black Top.

GALTEE MORE. ROSSTREVOR. London, Midland and Scottish Railway.
Length, 276 ft. 1 in. ; Gross Tonnage, 1,112 ;
Funnel : Yellow, Black Top.

CADILLAC. SARANAC. Anglo American Oil Co. Length, 530 ft. 2 ins. ;
Gross Tonnage, 12,074 ;
Funnel : Red, Black Top.

BARGE NAVAHOE. Anglo American Oil Co. Length, 450 ft. ; Gross Tonnage, 7,718.

DIMENSIONS AND PARTICULARS
OF
BRITISH AND FOREIGN WARSHIPS.

LIST OF BRITISH AND FOREIGN SHIPS.

The following abbreviations are used throughout the Alphabetical List:—

a.c.	Armoured cruiser.
a.g.b.	Armoured gunboat.
b.	Battleship.
b.c.	Battle-cruiser.
l.cr.	Light cruiser.
Flot. ldr.	Flotilla leader.
c.d.s.	Coast-defence ship.
P. L. Cr.	Protected light cruiser.
cr.	Cruiser.
A.A.	Anti-aircraft guns. (H.A. = High angle)
g.b.	Gunboat.
g.v.	Gun-vessel.
H.A.	High angle = A.A. Anti-aircraft.
H.N.S.	Harvey nickel steel.
H.S.	Harveyised or similar hard-faced steel.
K.S.	Krupp steel.
p.v.	patrol vessel.
t.	Turret-ship (in class column).
t.	Speed and H.P. at trials (in speed and H.P. columns).
s.c.	Sea-plane carrier.
to.cr.	Torpedo-cruiser.
to.g.b.	Torpedo-gunboat.
l.	Light guns under 15 cwt., including boats' guns.
M.	Machine guns.
sub.	Submerged torpedo tube.

The following abbreviations are used to distinguish the various types of boilers:—

W.T.	Water-tube boilers, where the type is not known.
B.	Belleville.
Bl.	Blechynden.
B. & W.	Babcock and Wilcox.
D'A.	D'Allest.
My.	Myabara.
N. or Nic.	Niclausse.
Nor.	Normand.
N.S.	Normand-Sigaudy.
T.	Thornycroft.
T.S.	Thornycroft-Schulz.
Y^1.	Yarrow small tube.
Y^2.	Yarrow large tube.

The following abbreviations distinguish types of turbines:—

P.T.	Parsons.
(G.)	Geared turbines.
C.T.	Curtis.
B.C.T.	Brown-Curtis.

A reference is now given in the tables to the pages on which diagrams of the ships appear.

GREAT BRITAIN.—Armoured Ships

Class.	NAME. DATE FOR SCRAPPING.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Makers of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Fuel.		Complement.
												Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.		Coal.	Oil.	
																Heavy Guns.	Second-ary.						
		tons	ft.	ft.	ft.						£	in.	in.	in.	in.	in.	in.			knots.	tons		
b.	**Ajax** . . . 1925 *See p.* 482.	23,000	555	89	27½	28,000 B. & W.	Greenock	Scott . P.T.	1912	1913	1,937,631*	12–6	..	9	..	10	3·1	10 *13·5-in.*, 12 *4-in.*, 4 *3-pr.*, 5 M.; 10 L.	2	21 *t*	3150	850	900
b.	**Barham** . . 1935 *See p.* 480.	27,500	580	90½	28¾	75,000 B. & W.	Clydeb'nk	J. Brown B.C.T.	1914	1915	..	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in* A.A.; 5 M.; 10 L.	4	25	Oil 2800		925
b.	**Benbow** . . 1934 *See p.* 481.	25,000	580	90	28	29,000 B. & W.	Dalmuir .	Beardmore P.T.	1913	1914	2,027,115*	12–8	1–2½	9–8	1–1½	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.* 2 *3-in.* A.A.; 5 M.; 10 L.	4	21	3250	1050 Oil	828
b.	**Centurion** . 1925 *See p.* 482.	23,000	555	89	27½	28,200 Y²	Devonp'rt	Hawthorn P.T.	1911	1913	1,939,648*	12–6	..	9	..	10	3·1	10 *13·5-in.*, 12 *4-in.*, 4 *3-pr.*; 5 M.; 10 L.	2	21 *t*	3150	850	900
b.	**Emperor of India** . 1934 *See p.* 481.	25,000	580	90	28	29,000 Y.	Barrow .	Vickers . P. T.	1913	1914	2,020,017*	12–8	1–2½	9–8	1–1½	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	21	3250	1050 Oil.	828
b.c.	**Hood** . . 1941 *See p.* 484.	41,200	810	104	28½	144,000	Clydeb'k	J. Brown . B.C.T. (G.)	1918	1920	5,843,039*	12–6	3–1	7–5	5–4	15–11	(*a*)	8 *15-in.*, 12 *5·5-in.*, 4 *4-in.* A.A., 4 *3-pr.*	4 (deck) 2 (sub.)	31	4000	1200 Oil	1433
b.	**Iron Duke** . 1934 *See p.* 481.	25,000	580	90	28	29,000 B. & W.	Portsm'th	Cammell Laird P.T.	1912	1914	2,080,918	12–8	1–2½	9–8	1–1½	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.* 2 *3-in.* A.A.; 5 M.; 10 L.	4	21 *t*	3250	1050 Oil	828
b.	**King George V.** . 1925 *See p.* 482.	23,000	555	89	27½	28,005 B. & W.	Portsm'th	Parsons . P.T.	1911	1912	1,965,413*	12–6	..	9	..	10	3·1	10 *13·5-in.*, 12 *4-in.*, 4 *3-pr.* 5 M.; 10 L.	2	21 *t*	3150	850	900

b.	**Malaya¶** 1934 *See p.* 480.	27,500	580	90½	28¾	75,000 B. & W.	Walker	Wallsend P. T.	1915	1916	¶	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	25	Oil 3400	925
b.	**Marlborough** 1934 *See p.* 481.	25,000	580	90	28	29,000 Y^2	Devonport	Hawthorn P.T.	1912	1914	2,043,437	12–8	1–2½	9–8	1–1½	10	6	10 *13·5-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M; 10 L.	4	21 *t*	3250 1050 Oil	828
b.	**Nelson** 1942	35,000	..	..	..	..	N'wc'stle-on-Tyne	Wallsend	Bldg.	..	..	..	..	..	..	..	..	*16-in.*	..	..	..	..
b.	**Queen Elizabeth** 1935 *See p.* 480.	27,500	580	90½	28¾	75,000 B. & W.	Portsm'th	Wallsend P.T.	1913	1915	..	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	25	Oil 3400	925
b	**Ramillies** 1941	25,750	580	88½	28½	40,000 Y.	Dalmuir	Beardmore, P.T.	1916	1917	..	13–6	4–1	6	6–4	11	6	8 *15-in.*, 14 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	23	3420 Oil	915
b.	**Resolution** 1937 *See p.* 479.						Jarrow	Palmer P.T.	1915	1916												
b.	**Revenge** 1937	25,750	580	88½	28½	40,000 Y.	Barrow	Vickers P.T.	1915	1916	..	13–6	4–1	6	6–4	11	6	8 *15-in.*, 14 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M; 10 L.	4	23	3420 Oil	915
b.	**Royal Oak** 1938						Devonp'rt	Hawthorn P.T.	1914	1916	2,468,269											
b.	**Royal Sovereign** 1936 *See p.* 479.						Portsm'th	Parsons P.T.	1915	1916	2,570,929											
b.c.	**Renown** 1940	26,500	750	90	25½	112,000 B. & W.	Govan	Fairfield B.C.T.	1916	1916	3,111,284	6–3 K.C.	2	6–3	4–3	9–7 K.C.	6 K.C.	6 *15-in.*, 17 *4-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	2†	31·5	4250 Oil.	950
b.c.	**Repulse** 1939 *See p.* 485.						Clydeb'nk	J. Brown B.C.T.	1916	1916	2,760,062											
b.	**Rodney** 1942	35,000	..	..	..	..	Birkenh'd	Cammell Laird	Bldg.	..	..	..	..	..	..	..	..	*16-in.*	..	..	..	..
b.	**Thunderer** 1925 *See p.* 483.	22,500	545	88½	27½	27,604 B. & W.	Blackwall	Thames Ironworks P. T.	1911	1912	1,889,920*	12	..	9	..	10	Nil.	10 *13·5-in.*, 8 *4-in.*, 1 *3-in.* A.A., 4 *3-pr.*; 5 M.; 10 L.	2	21	900 2700	800

* Total estimated cost of ship including guns.

† Repulse has also 8 above-water torpedo tubes.

¶ Built at the charge of the Federated Malay States.

(*a*) Guns are in shields of 1-in. H.T. plating.

GREAT BRITAIN.—Armoured Ships—*continued.*

Class.	NAME. DATE FOR SCRAPPING.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed	Fuel.	Complement.
												Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns.	Torpedo Tubes.		Coal. Oil.	
		tons.	ft.	ft.	ft.						£.	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.c.	**Tiger.** . . . 1935 *See p.* 486.	28,500	660	90½	28½	108,000 B. & W.	Clydeb'nk	J. Brown . B. C. T.	1913	1914	2,500,000*	9–3	3–1	6	4–2	9	6	8 *13·5-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	30	3320 900	1110
b.	**Valiant** . . 1939 *See p.* 480.	27,500	580	90½	28¾	75,000 B. & W.	Govan .	Fairfield . B. C. T.	1914	1916	. .	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	25	Oil 3400	925
b.	**Warspite** . . 1935 *See p.* 480.	27,500	580	90½	28¾	75,000 B. & W.	Devonp'rt	Hawthorn P.T.	1913	1915	. .	13–6	3–1	6	4–2	10	6	8 *15-in.*, 12 *6-in.*, 4 *3-pr.*, 2 *3-in.* A.A.; 5 M.; 10 L.	4	25	Oil 3400	925

* Total estimated cost of ship, including guns.

The dates placed under the names of ships indicate the years in which they are to be scrapped according to the Washington Treaty.

The following ship is in the non-effective category: Agamemnon, battleship, Fleet target service.

The battle-cruiser Lion has been removed from the effective list, and although retained temporarily out of commission at Rosyth, is to be disposed of under the Washington Treaty.

River Gunboats.

Two classes of river gunboats were added to the Navy during the war. The larger class has a displacement of 640 tons, length 230 ft., beam 36 ft., draught 4 ft., H.P. 2,000, speed 14 knots, armament, two 6-in., two 12-prs., six M.; fuel capacity, coal 35, oil 54 tons. Names:—Aphis, Bee, Cicala, Cockchafer, Cricket, Glowworm, Gnat, Ladybird, Mantis, Moth, Scarab and Tarantula. The smaller class has been scrapped. Older vessels of this category still remaining in commission are the Moorhen, Robin, Teal, Widgeon, Woodcock, and Woodlark.

GREAT BRITAIN.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Fuel.	Complement.
												Belt. Deck.	Gun Position.	Guns.	Torpedo Tubes.		$\frac{\text{Coal.}}{\text{Oil.}}$	
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
S.C. .	. Argus .	. 14,450	565	68	22¾	20,000	Dalmuir .	Beardmore T.	1917	1918	..	..	..	2 *4-in.*, 4 *4-in.* A.A., 14 M.	..	20¾	$\frac{}{2000}$	401
S.C. .	. Ark Royal.	. 7080	366	51	17½	3000	Blyth	Blyth S. B. Co.	1914	1914	..	..	..	4 *2-pr.*, 14 M.	..	11	500 Oil.	..
Cr. .	. Birmingham	. 5440	430	49·10	15·10	26,500	Elswick .	Hawthorn. T.	1912	1914	353,487*	..	..	9 *6-in.*, 4 *3-pr.*, 1 *3-in.* A.A.	2	25·5	650	400
L. Cr.	. Courageous	18,600	735	81	22·3	90,000 Y.	Walker . (Armstr'g)	Parsons . P.T.(G.)	1916	1917	..	3	9–7	4 *15-in.*, 18 *4-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 5 M.; 10 L.	$\frac{2}{12}$	31	$\frac{\text{Oil}}{3250}$	785
”	. Glorious (a) *See p.* 487.						Belfast .	Harland & Wolff T.(G.)										
S.C.	. Furious .	. 19,100	735	88	21·6	90,000	Walker (Armstrong)	Wallsend Engn'g Co. T.(G.)	1916	1917	1,920,000†	3	7	10 *5·5-in.*, 5 *3-in.* A.A., 2 *3-pr.*, 14 M.	$\frac{2}{16}$	31	$\frac{\text{Oil}}{3400}$	725

(a) To be converted into an aircraft carrier.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Fuel. Coal. / Oil.	Complement.
												Belt. / Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
P. L. Cr. .	Calliope .	3750	420	41	13·6	40,000	Chath'm	Parsons . P.T. (G.)	1914	1915	..	3	..	4 6-*in.*, 2 3-*in.* A.A.‡ 2 2-*pr.* Pom Poms ; 1 M. ; 8 L.	4 §	29	Oil 900	287
„ „ .	Carysfort .						Pembroke	Hawthorn. B.C.T.	1914	1915								
„ „ .	Champion						Newcastle (Hawth'rn)	Hawthorn. P.T. (G.)	1914	1915								
„ „ .	Cleopatra .						Devonport	Cammell Laird P.T.	1914	1915								
„ „ .	Comus .						Newcastle (Swan Hunter)	Wallsend Engn'g Co. P.T.	1914	1915								
„ „ .	Conquest . *See p.* 492.						Chatham	Scotts' . P.T.	1914	1915								
„ „ .	Cairo .	4190	425	43·6	14·6	40,000	Birken-head	Cammell Laird T.(G.)	1918	1919	..	3	..	5 6-*in.*, 2 3-*in* A.A., 4 3-*pr.* ; 2 2-*pr.* Pom Poms.	8	29	Oil 900	287
„ „ .	Calcutta .						Barrow .	Vickers . T. (G.)	1918	1919								
„ „ .	Cape Town						Birken-head	Cammell Laird T.(G.)	1919	1922								
„ „ .	Carlisle .						Govan .	Fairfield . T. (G.)	1918	1918								
„ „ .	Colombo . *See p.* 491.						Govan .	Fairfield . T. (G.)	1918	1919								
„ „ .	Caledon .	4120	425	42·9	14·6	40,000	Birken-head	Cammell Laird T.(G.)	1916	1917	300,000	3	..	5 6-*in.*, 2 3-*in.* A.A., 4 3-*pr.* ; 2 2-*pr.* Pom Poms ; 2 M. ; 8 L.	8	29	Oil 900	287
„ „ .	Calypso .						Glasgow	Scotts' . T. (G.)	1917									
„ „ .	Caradoc . *See p.* 491.						Barrow .	Vickers . T. (G.)	1916									

P. L. Cr.	**Cambrian** .	3750	420	41·6	14·6	40,000	Pembroke	T.	1916	1916	300,000†	3	..	4 *6-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 2 *2-pr.*, Pom Poms; 1 M.; 8 L.	2	29	Oil / 900	287
,, ,,	**Canterbury**						Clydebank	J. Brown . T.	1915	1916								
,, ,,	**Castor** .						Birkenhead	Cammell Laird T.	1915	1915								
,, ,,	**Constance**. *See p.* 492.						Birkenhead	Cammell Laird T.	1915	1916								
,, ,,	**Cardiff** .	4190	425	43·6	14·6	40,000	Govan .	Fairfield . T. (G.)	1917	1917	..	3	..	5 *6-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 2 *2-pr.* Pom Poms.	8	29	Oil / 900	287
,, ,,	**Ceres** .						Clydebank	J. Brown . T. (G.)	1917	1917								
,, ,,	**Coventry** .						Newcastle (Swan Hunter)	Swan Hunter T. (G.)	1917	1918								
,, ,,	**Curacoa** .						Pembroke	Harland & Wolff T. (G.)	1917	1918								
,, ,,	**Curlew** . *See p.* 491.						Barrow .	Vickers . P.T. (G.)	1917	1917								
,, ,,	**Centaur** .	3750	420	42	13·6	40,000	Elswick	Armstrong T.	1916	1916	300,000†	3	..	5 *6-in.*, 2 *3-in.*, A.A., 2 *3-pr.*, 2 *2-pr.* Pom Poms; 2 M.; 4 L.	2	29	Oil / 900	287
,, ,,	**Concord** . *See p.* 491.						Elswick	Armstrong T.										
Cr .	**Dartmouth** .	5250	430	48½	15½	23,467 Y.	Barrow .	Vickers . P.T.	1911	1911	329,406*	2–¾	..	8 *6-in.*, 4 *3-pr.*, 4 M., 1 *3-in.* A.A.	2	25·9 *t*	1290 / 260	390
P. L. Cr.	**Despatch** .	4765	445	46	14·3	40,000	Govan .	Fairfield . T. (G.)	1919	1922	..	3	Shields	6 *6-in.*, 2 *4-in.* A.A., 2 M.	12	29	Oil / 1050	340
,, ,,	**Diomede** . *See p.* 490.	4750					Barrow	Vickers . T. (G.)	1919	1922								
,, ,,	**Danae** .	4750	445	46	14·3	40,000	Elswick	Armstrong T. (G.)	1918	1918	..	3	Shield	6 *6-in.*, 2 *3-in.* A.A., 2 M.	12	29	Oil / 1050	340
,, ,,	**Dauntless** .						Jarrow .	Palmer . T. (G.)	1918	1918								
,, ,,	**Dragon** . *See p.* 490.						Green'ck	Scott . T. (G.)	1917	1918								

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* Total estimated cost of ship, including guns.

† Estimated cost as originally designed.

‡ The Champion of this class has 4-in. anti-aircraft guns; Comus, Carysfort, and Calliope have 4 3-pr.

§ Champion and Calliope have 2 submerged tubes.

GREAT BRITAIN.—Cruising Ships, &c.—*continued.*

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt. / Deck.	Armour. Gun Position.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Fuel. Coal. / Oil.	Complement.
		tons.	ft.	ft.	ft.						£	in.	in.			knots.	tons.	
P. L. Cr.	**Delhi**	4750	445	46	14·3	40,000	Elswick	Armstrong T. (G.)	1918	1919	..	3	Shields	6 *6-in.*, 2 *3-in.* A.A. (Durban 2 *4-in.* A.A.), 2 M.	12	29	Oil / 1050	340
,, ,,	**Dunedin**	4750					Elswick	Armstrong T. (G.)	1918	1919								
,, ,,	**Durban** *See p.* 490.	4765					Green'ck	Scott T. (G.)	1919	1921								
Cr.	**Dublin**	5400	430	49·10	15¾	25,000 Y.	Dalmuir	Beardmore P. T.	1912	1913	337,565*	3 / –	..	8 *6-in.*, 1 *3-in.* A.A., 1 *12-pr.*, 16 M.	2	25·5	1240 / 260	400
S.C.	**Eagle,** *ex* Almirante Cochrane.	22,790	625	92	24	55,000	Walker	J. Brown T.	1918	..	3,310,042	..	..	12 *6-in.*, 4 *4-in.* A.A.	..	24	3750 / Oil	744
P. L. Cr.	**Effingham**	9750	565	65	17·3	70,000 (Hawkins 60,000)	Portsmouth	Harland & Wolff. T.	1921	..	750,000†	3	Shields	7 *7·5-in.*, 4 *3-in.* A.A., 2 *2-pr.*; 2 M.; 8 L.	6	30	1500 / 800 Oil	480
,, ,,	**Frobisher**						Devonport	Wallsend Eng. Co. T.	1920	..								
,, ,,	**Hawkins** *See p.* 489.						Chatham	Parsons Co. T. (G.)	1917	1919								
P. L. Cr.	**Enterprise**	7550	535	54½	16½	80,000	Clydebank	John Brown T. (G.)	1919	..	..	3–1½ / 1	..	7 *6-in.*, 2 *4-in.* A.A., 4 *3-pr.*, 2 *2-pr.* Pom Poms.; 1 M.	12	33	1600 / 650 Oil	556
,, ,,	**Emerald** *See p.* 488.						Elswick	Armstrong T. (G.)	1920	..	..							
S. C.	**Hermes**	10,950	548	70	18¾	40,000	Elswick	Parsons Co. T. (G.)	1919	..	..	..	..	10 *5·5-in.*, 4 *4-in.* A.A.	..	25	2000 / Oil	664

Cr. . . .	**Lowestoft** . .	5440	430	49	15	25,000	Chatham.	Fairfield . T.	1913	1914	375,162	..	..	9 *6-in.*, 4 *3-pr.*, 1 *3-in.*, A.A.	2	25·5	650	400
S. C. . .	**Pegasus** . . (late Stockholm)	3070	332	43	14½	9,500 *t*	Clydeb'nk	J. Brown . B.C.T.(G.)	1917	1917	..	..	..	4 *12-pr.* (2 A.A.), 15 M.	Nil.	20·25	360 / Oil	182
Minelayer .	**Princess Margaret** .	5440	395½	54	16½	15,000	Dumbarton. Purchased 1919	Denny .	1914 (Refitted 1921–22)	1914	..	..	..	2 *4-in.*, 2 *3-in.* A.A.	Nil.	22½	585 Oil	233
Cr. . . .	**Southampton** .	5400	430	49·10	15¾	25,000 Y.	Clydeb'nk	J. Brown . C.T.	1912	1913	336,469*	3 / —	..	8 *6-in.*, 1 *3-in.* A.A., 16 M.	2	25·5	1240 / 260	400
L. Cr. . .	**Vindictive** . *ex* Cavendish *See p.* 493.	9750	565	65	20·4	60,000	Belfast	Harland & Wolff T.(G.)	1918	1918	..	..	..	4 *7·5 in.*, 4 *3-in.*, Q.F., 4 *3-in.* A.A., 1 *12-pr.*, 13 M.	6	28·75	800 / 1420	..
L. Cr. . .	**Weymouth**	5250	430	48½	15½	22,000 Y.	Elswick	Parsons . P. T.	1910	1911	337,738*	2¾	..	8 *6-in.*, 1 *12-pr.*, 1 *3-in.* A.A., 16 M.	2	25·5 *t*	1290 / 260	390
" . . .	**Yarmouth**						Glasgow	London & Glas. Co. C. T.	1911	1912	353,238*							

* Total estimated cost of ship, including guns.

† Estimated cost as originally designed.

There are a number of other vessels on the non-effective list which are being used for various purposes as repair ships, and other auxiliary work, including depôt ships for destroyers and submarines.

Defence Forces of the Dominions.

ROYAL AUSTRALIAN NAVY.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Maker of Engines.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal. / Oil	Complement.
												Belt. / Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.						£	in.	in.			knots	tons.	
L. Cr. . .	Adelaide . .	5560	430	49½	15¾	25,000	Sydney	T.	1918	1922	..	..	..	9 *6-in.*, 1 *12-pr.*, 5 M. 1 *3-in.* A.A.	2	26	869 / 500	470
,, . .	**Melbourne** .	5400	430	49½	15¾	25,000	Birkenhead	Cammell Laird. T.	1912	1913	..	..	..	8 *6-in.*, 4 *3-pr.*, 4 M., 1 *3-in.* A.A.	2	25·5	1148 / 271	390
,, . .	Sydney . .						Glasgow	London & Glasgow Co. T.	1912	1913							1210 / 260	392
,, . .	Brisbane . .						Sydney	Vickers T.	1915	1916							1196 / 260	391
Flot. Ldr. .	Anzac . .	1670	315	31·9	10	36,000	Dumbarton	Denny . T.	1917	1917	..	..	..	4 *4-in.* Q.F., 7 M.	2	34	515 Oil	..

DESTROYERS.—" *River* " *Class* :—Huon, Parramatta, Swan, Torrens, Warrego, Yarra. Launched, 1910-15; Displacement, 700 tons; 9,500–11,300 H.P.; speed, 27 knots; armament, one 4-in., three 12-pdrs., three tubes.

" *S* " *Class* :—Stalwart, Success, Swordsman, Tasmania, Tattoo. Launched, 1918–19; Displacement, 1,250 tons; 27,00 H.P.; speed, 36 knots; armament, three 4-in., one 2-pdr., 6 tubes (4 21-in., 2 18-in.).

SUBMARINES.—" *J* " *Class* :—J 1, J 2, J 3, J 4, J 5, J 7. Launched, 1916–18; Displacement, surface, 1,210 tons, submerged, 1,820 tons; H.P., surface, 3,600, submerged, 1,350; speed, surface, 19 knots, submerged, 9½ knots; oil fuel, 91 tons; armament, one 3-in. or 4-in., six 18-in. tubes. (Will probably be scrapped, 1924.)

SLOOPS.—" *Flower* " *Class* :—Mallow, Marguerite, Geranium. Launched, 1915; Displacement, 1,250 tons; 2,000 H.P.; speed, 17 knots; armament, one 4·7-in.. two 3-pr. A.A.

The Royal Australian Navy also includes the Cerberus, gunboat; Platypus, submarine depôt ship; Pioneer, light cruiser; Countess of Hopetoun, torpedo boat, and some old cruisers and sloops which were lent for service during the war, as well as certain armed patrol vessels taken up for the same purpose.

NEW ZEALAND NAVY.

Light Cruiser.—"*City*" *Class*:—Chatham. Completed, 1912 (Chatham Dockyard and Thames Ironworks). Displacement, 5,400 tons; 25,000 H.P.; speed, 25½ knots; armament, eight 6-in., four 3-pr., one 3-in. A.A., four M., two 21-in. tubes; max. coal, 1,240 tons; oil, 260 tons; complement, 400.

Ex-Light Cruiser.—"*Pearl*" *Class*:—Philomel. (Training and Depôt-ship, Auckland). Completed, 1892 (Devonport and Earle). Displacement, 2,575 tons; 7,500 H.P.; speed 19 knots: armament, one 6-in., one 4-in., two 12-pr.; coal, 300 tons; original complement, 217.

NEWFOUNDLAND.

Sloop.—"*Flower*" *Class*:—Lobelia. Completed 1916 (Simons). Displacement, 1,250 tons; 2,000 H.P.; speed, 17 knots; armament, one 4·7-in., two 3-pr. A.A.

ROYAL CANADIAN NAVY.

Light Cruiser.—"*Arethusa*" *Class*:—Aurora. Completed, 1914 (Devonport Dockyard and Parsons Co.). Displacement, 3,500 tons; 40,000 H.P.; speed, 30 knots; armament, two 6-in., six 4-in. Q.F., one 4-in. A.A., one M., four 21-in. tubes; oil, 840 tons; complement, 270.

Destroyers.—"*M*" *Class*:—Patrician and Patriot. Completed, 1916 (Thornycroft). Displacement, 980 tons; 26,500 H.P.; speed, 35 knots; armament, three 4-in., two 1½-pdrs., four 21-in. tubes; oil, 256 tons (radius of action, 1,510 at 15 knots).

Submarines.—"*H*" *Class*:—H 14, H 15. Surface displacement, 440 tons, submerged, 500; surface H.P., 480, submerged, 320; surface speed, 13 knots, submerged, 10½ knots; oil fuel, 16 tons; armament, four 21-in. tubes.

Minesweepers.—Festubert and Ypres, stationed at Halifax; and Armentieres and Thiepval, stationed at Esquimalt.

The Royal Canadian Navy has no effective ships of the larger classes, the cruisers Niobe and Rainbow, which were lent for training purposes, being ordered in March, 1920, to be paid off for sale. The Stadacona is in service as depôt-ship at Halifax and the motor-vessel Naden as depôt-ship at Esquimalt.

SOUTH AFRICA.

Surveying Ship.—"*Beaufort*" *Class*:—Protea (ex-Crozier). Twin-screw mine-sweeper, converted 1919. Displacement, 800 tons; 2,200 H.P.; speed, 16 knots; coal capacity, 181–185 tons; armament, one 3-pr. Transferred to South Africa, September, 1921.

Trawlers.—*Admiralty Type*:—Immortelle and Sonneblom (late Eden and Foyle). Armament, one 12-pr. Transferred to South Africa, September, 1921, for mine-sweeping instructional duties.

The gunboat Afrikander (late Tickler) is employed as depôt-ship at Simonstown.

ARGENTINE REPUBLIC.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a.c.	**Garibaldi** . .	6840	328	59¾	24	13,384	Sestri Ponente	1895	1896	752,000	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	2 *10-in.*, 10 *6-in.*, 6 *4·7-in.*, 4 *2·2-in.*, 2 M.	2	19·9 *t*	1000	500
a.c.	**General Belgrano** .	7069	328	59¾	24	13,000	Leghorn .	1897	1899	696,700	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	2 *10-in.*, 14 *6-in.*, 2 *3-in.*, 4 *2·2-in.*, 2 L., 2 M.	..	20·1 *t*	1000	500
a.c.	**General San Martin**	6773	328	59¾	24	13,000	Leghorn .	1896	1898	688,200	6–3 H.S.	1½	6 H.S.	6 H.S.	6 H.S.	6 H.S.	4 *8-in.*, 10 *6-in.*, 6 *4·7-in.*, 4 *2·2-in.*, 2 L., 2 M.	4	19·8	1100	500
b.	**Moreno** . . **Rivadavia** . *See p.* 494.	27600	585	98	27½	39.500 B. & W. Curtist.	Camden, N.J. (N.Y.S.B.Co.) Quincy, Mass.	1911	1914 1915	2,200,000	12–10 K.S.	3–2	9–6 K.S.	9 K.S.	12–9 K.S.	6 K.S.	12 *12-in.*, 12 *6-in.*, 16 *4-in.*, 8 smaller.	2 sub.	22 *t*	1600 4000	1046
a.c	**Pueyrredon** . .	6773	328	59¾	24	13,000 B.	Sestri Ponente	1898	1901	782,000	6–3 H.S.	1½	6 H.S.	5 H.S.	6 H.S.	6 H.S.	2 *10-in.*, 10 *6-in.*, 6 *4·7-in.*, 4 *2·2-in.*, 2 M.	..	20·1 *t*	1000	500

The old coast-defence ironclads Libertad and Independencia, 2336 tons, completed at Birkenhead in 1892–93, carry two 9·4-in., four 4·7-in., and four 3-pr. guns.

Cruiser Buenos Aires (Elswick, 1895), 4780 tons, two 8-in., four 6-in., six 4·7 in., three T.T., 23·2 knots on trial; river gunboats Patria (1894), 1070 tons, two 4·7 in., eight smaller, five T.T., Paraná and Rosario (Elswick, 1909), 1000 tons, two 6-in. howitzers, six 12-pr., twelve smaller, 15 knots. For destroyers, see Flotilla Tables.

The training-ship (cruiser) Presidente Sarmiento, 2750 tons; also the old cruiser Nueve de Julio, 3570 tons, Elswick 1902, and several small gunboats and torpedo-gunboats. There are 14 transports and many auxiliaries and 18 additional have recently been acquired in Europe.

The programme for a considerable reorganisation and the augmentation of the resources of the Navy is still in abeyance.

BRAZIL.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour. Belt.	Armour. Deck.	Armour. Side above Belt.	Armour. Bulkheads.	Armour. Gun Position. Heavy Guns.	Armour. Gun Position. Second-ary.	Armament. Guns.	Armament. Torpedo Tubes.	Speed.	Coal.	Complement.
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in			knots.	tons.	
c.d.s., t.	**Marshal Deodoro**	3112	267½	48	13¼	3400 D'A.	La Seyne	1898	1900	..	13¾–4 H.S.	1½	..	..	8 H.S.	3 H.S.	2 *9·4-in.*, 4 *4·7-in.*, 2 M., 4 *6-pr.*, 2 *1-pr.*	2 (sub.)	15·0	236	200
c.d.s., t.	**Marshal Floriano**							1899	1901												
b.	**Minas Geraes** *See p.* 495.	19,281	500	83	25	27,212 *t* B.&W.	Elswick	1908	1909	1,821,400	9–6–4 K.S.	2	9–6–4 K.S.	9	12–8 K.S.	9 K.S.	12 *12-in.*, 22 *4·7-in.*, 8 *3-pr.*	4	21·5 *t*	900 2400	900
b.	**São Paulo** *See p.* 495.	19,281	500	83	25	28,645 *t* B.&W.	Barrow	1909	1910	1,821,400	9–6–4 K.S.	2	9–6–4 K.S.	9 K.S.	12–8 K.S.	9 K.S.	12 *12-in.*, 22 *4·7-in.*, 8 *3-pr.*	4	21·5 *t*	900 2400	900

The Minas Geraes and São Paulo have been completely refitted at the Brooklyn Navy Yard.

Light Cruisers:—Bahia and Rio Grande do Sul, completed at Elswick, 1910, 3100 tons, ten 4·7-in., eight 1·8-in. guns, 17,000 H.P., 27 knots; Barroso (Elswick, 1897), 3600 tons, six 6-in., four 4·7-in. guns, 20 knots; also the old crusier Republica, now a mine-layer. Four 12-knot river gunboats, Missões, Acre and two others (Poplar, 1907). Carlos Gomes, mine-layer (550 mines). Torpedo-gunboat Tymbira, fitted as mine-layer. Also river monitors Maranhao and Pernambuco, built at Rio de Janeiro.

CHILE.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			kts.	tons.	
b	**Almirante Latorre** . (ex Canada) *See p.* 496.	. 28,000	625	92	28½	37,000 P. tur. Y 2	Elswick .	1913	1915	..	9–4 A.I.	4–2½	4½	..	10	6	10 *14-in.*, 14 *6-in.*, 2 *3-in.* and smaller	4 sub.	23	3300 520	1000
s.c.	**O'Higgins** . .	. 8,500	411¾	62½	22	16,000 B.	Elswick .	1897	1898	..	7–5	2	..	..	7½–6	6	4 *8-in.*, 10 *6-in.*, 4 *4·7-in.*, 10 *12-pr.*, 10 *6-pr.*, 4 M.	3 (2 sub.)	21·5 *t*	1260	500
b.	**Capitan Prat** . .	. 5,981	328	60¾	21¾	12,000	La Seyne	1890	1893	391,000	12	3	4	..	10½	2	4 *9·4-in.* (Canet), 8 *4·7-in.* (Canet), 10 *12-pr.*, 14 smaller and M.	4	18·3 *t*	775	480
a.c.	**Esmeralda** . .	. 7,020	436	53¼	22¼	16,000	Elswick .	1896	1897	..	6 H.S.	2	..	6 H.S.	4½ Shields	..	2 *8-in.*, 16 *6-in.*, 8 *12-pr.*, 2 *3-pr.*, 4 M.	3	22·8 *t*	1350	500

Capitan Prat reconstructed.

Cruising Ships, &c.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.						in.	in.			knots.	tons.	
cr.	**Blanco Encalada** . .	4400	370	46½	18½	14,500	Elswick .	. 1893	1894	..	4–1½	..	2 *8-in.*, 10 *6-in.*, 12 *3-pr.*, 10 *1-pr.**	5	22·78 *t*	900	427
„	**Chacabuco** . . .	4500	360	46	18	15,750	Elswick .	. 1901	1903	..	4½–1¾	..	2 *8-in.*, 10 *4·7-in.*, 16 *1·8-in.*, 2 M., 1 l.	5	23·0	1000	350
„	**General Baquedano** (Training)	2330	240	45¼	18	1500 B.	Elswick .	. 1898	1900	..	..	..	4 *4·7-in.*, 2 *12-pr.*, 2 *6-pr.*, 2 M., 1 l.	1	13·7 *t.*	300	302
„	**Ministro Zenteno** .	. 3600	330¼	43¾	16¾	6500	Elswick .	. 1896	1898	..	..	..	8 *6-in.*, 10 *6-pr.*, 4 *1-pr.** .	3	20·0*t*	800	280
„	**Presidente Errázuriz** . (Training)	2047	268	35¾	19½	5400	La Seyne	. 1890	1892	..	3½	..	4 *6-in.* (Canet), 2 *5-in.*, 4 *2·2-in.*, 6 M.	3	19·0	200	171

* Armstrong.

Transports: Maipo, 11,000 tons; Rancagua, 10,000 tons; Angamos, 5,000 tons; Aguila, 600 tons; Porvenir, 300 tons. Sloops or patrol vessels: Orompello, Leucoton, Elicura, Colocolo, 500 tons; Yancz, Yelcho, Huemul, Condor, 100 to 250 tons.

DENMARK.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Fuel.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.s.,t.	**Herluf Trolle**	3595	271	50	16¼	4400 T.	Copenhagen	1899	1901	..	7–4 H.S.	3	..	..	7 H.S.	6 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 6 *12-pr.*, 2 *6-pr.*	3 (sub.)	16·5	250	250
c.d.s.,t.	**Niels Juel**	4100	295	53½	15¾	5500	Copenhagen	1918	1923	..	8–4 K.S.	2	..	7	..	2 K.S.	10 *5·9-in.*, 3 *6-pr.*	2 (sub.)	17·0	250 Oil	250
c.d.s.,t.	**Olfert Fischer**	3050	271	50	16¼	4600	Copenhagen	1903	1905	..	7–4 K.S.	3	..	..	7 K.S.	6	2 *9·4-in.*, 4 *5·9-in.*, 6 *12-pr.*, 2 *6-pr.*	3 (sub.)	16·0	250	250
c.d.s.,t.	**Peder Skram**	3735	274¼	51½	16¼	5400	Copenhagen	1908	1909	..	8–4 K.S.	2	..	..	7 K.S.	6 K.S.	2 *9·4-in.*, 4 *5·9-in.*, 10 *14-pr.*, 2 *1-pr.*	4	16·0	250	250
c.d.s.,t.	**Skjold**	2200	226½	38	13½	2400 T.	Copenhagen	1896	1899	..	10–3 H.S.	2	..	7	8	5½	1 *9·4-in.*, 3 *4·7-in.* (K.), 4 *6-pr.*	4	13·0	280	210

Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.				tons.	
3rd cl. cr.	**Geiser**	1280	232	34	11¼	3600 T.	Copenhagen	1892	1893 1907	..	1½	..	2 *4·7-in.*, 4 *20-pr.*, 4 *6-pr.*	2	17·1 t	150	155
"	**Heimdal**	1313	232	34	11¾	3100 T.	Copenhagen	1894	1896	..	1½	..	2 *4·7-in.*, 4 *20-pr.*, 4 *6-pr.*, 6 M.	2	17·5	150	155

Heimdal, used as cadets' training ship. Valkyrien (3020 tons), reconstructed 1913, training ship. Mine-layers Lossen, Hjælperen, Beskytteren, Minekran 1–6, Mining boats 1–10. Torpedo transport Slejpner. Fylla (ex-British sloop Asphodel), and 4 other fishery inspection cruisers. Groensund, submarine repair ship, Hekla, submarine depôt. Three surveying ships.

FRANCE.—Armoured Ships.

Class.	NAME. DATE FOR SCRAPPING.‡	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
															Gun Position.						
											Belt.	Deck.	Side above Belt.	Bulkhead.	Heavy Guns.	Second-ary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Bretagne** 1934 *See p.* 497.	23,177	544½	88½	29	29,000 N. tur.	Brest	1913	1915	2,589,439	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	10 *13·4-in.*, 18 *5·5-in.*	4 (sub.)	20·0	900 2700	1167
b.	**Condorcet** *See p.* 499.	18,600	475¾	84	27	22,500 N. tur.	St. Nazaire	1909	1911	2,165,200	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾ K.S.	4 *12-in.*, 12 *9·4-in.*, 12 *3-in.*, 2 *3-pr.*	2 (sub.)	19·25 *t*	960 2010	690
b.	**Courbet** 1930 *See p.* 498.	23,500	541⅓	88½	29	28,000 N. tur.	Lorient	1911	1913	2,508,388	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	12 *12-in.*, 22 *5·5-in.*, 4 *3-pr.*	4 (sub.)	20·0	900 2700	998
b.	**Diderot** *See p.* 499.	18,600	475¾	84	27	22,500 N. tur.	St. Nazaire	1909	1911	2,167,000	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾	4 *12-in.*, 12 *9·4-in.*, 12 *3-in.*, 2 *3-pr.*	2 (sub.)	19·25 *t*	960 2010	690
a.c.	**Edgar Quinet** *See p.* 501.	13,990	515	70¼	27½	39,803 *t* B.	Brest	1907	1911	1,307,536	6½–3½ K.S.	2½–1¼	5–2 K.S	4¾ K.S.	8 K.S.	4¾ K.S	14 *7·6-in.*, 14 *9-pr.*, and smaller	2 (sub.)	23·0 *t*	1242 2300	738
a.c.	**Ernest Renan** *See p.* 500.	13,500	515	70½	26¾	37,500 Nic., *t*	St. Nazaire	1906	1909	1,410,000	6¾–4 H.S.	2	5–3 H.S.	4¾	6 H.S.	5 H.S.	4 *7·6-in.*, 12 *6·5-in.*, and smaller	2 (sub.)	23·0 *t*	1354 2300	674
b.	**Jean Bart** 1930 *See p.* 498.	23,500	541¼	88½	29	28,000 B. tur.	Brest	1911	1913	2,528,888	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	12 *12-in.*, 22 *5·5-in*, 4 *3-pr.*	4 (sub.)	20·0	900 2700	998
a.c.	**Jules Ferry** *See p.* 500.	12,351	487	70¼	27	30,500 Guyot	Cherbourg	1903	1906	1,169,940	6¾–4 H.S.	2	5–3 H.S.	6	6 H.S.	5 H.S.	4 *7·6-in.*, 16 *6·4-in.*, 24 smaller	2 (sub.)	22·0 *t*	1320 2100	728
a.c.	**Jules Michelet** *See p.* 500.	13,100	489½	70¼	27	27,700 Guyot	Lorient	1905	1908	1,204,107	6–4 K.S.	2	5–3 K.S.	6 H.S.	8 K.S.	5 K.S.	4 *7·6-in.*, 12 *6·5-in.*, and smaller	2 (sub.)	22·0 *t*	1820 2100	724

b.	**Lorraine** . 1936 *See p.* 497.	. 23,177	544½	88½	29	29,000 tur. S. & cyl.	St. Nazaire	1913	1916	2,642,439	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	10 *13·4-in.*, 18 *5·5-in.*, 2 *14-pr.* A.A.	4 (sub.)	20·0	900 2700	1167
b.	**Paris** . . 1934 *See p.* 498.	. 23,500	541½	88½	29	28,000 N. tur.	La Seyne .	1912	1914	2,603,920	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	12 *12-in.*, 22 *5·5-in.*, 4 *3-pr.*	4 (sub.)	20·0	900 2700	998
b.	**Provence** . 1935 *See p.* 497.	. 23,177	544½	88½	29	29,000 tur.	Lorient .	1913	1915	2,589,000	11–7 K.S.	2¾–1¾	7 K.S.	7 K.S.	10½ K.S.	7 K.S.	10 *13·4-in.*, 18 *5·5-in.*, 2 *14-pr.* A.A.	4 (sub.)	20·0	900 2700	1167
a.c.	**Victor Hugo** *See p.* 500.	. 13,108	480½	70¼	27	28,486 *t.* B.	Lorient .	1904	1907	1,229,932	6¾–4 H.S.	2	5-3 H.S.	6	8 H.S.	5 H.S.	4 *7·6-in.*, 16 *6·4-in.*, 24 smaller	2 (sub.)	22·0 *t*	1320 2100	728
b.	**Voltaire** . *See p.* 499.	. 18,600	475¾	84	27	22,500 B. tur.	La Seyne .	1909	1911	2,169,200	10–8 K.S.	2¾	8¾	..	12 K.S.	8¾ K.S.	4 *12-in.* 12 *9·4-in.*, 12 *3-in.*, 2 *3-pr.*	2 (sub.)	19·25 *t*	960 2010	690
a.c.	**Waldeck-Rousseau** *See p.* 501.	. 13,990	515	70¼	27½	35,286 Nic. *t.*	Lorient .	1908	1911	1,301,380	6½–3½	2½	5	4¾	6	5½	14 *7·6-in.*, 14 *9-pr.*, and smaller	2 (sub.)	23·0 *t*	1242 2300	738

The battleship France, lost by striking a rock at Quiberon Bay, August 25, 1922, belonged to the Fleet authorised by the Treaty of Washington, but no provision has been made to replace her.
In the case of the battleships Condorcet, Diderot, and Voltaire, the date of scrapping has not been indicated.

The uncompleted battleship Béarn is being converted into an aircraft carrier at Toulon.
The armoured cruisers Condé, Gueydon, Marseillaise, and Montcalm (1902–4) are retained temporarily, and have been employed in auxiliary duties.
Patrie, 15,141 tons; Jeanne d'Arc, 11,300 tons; Pothuau, 5374 tons, training ships.

FRANCE.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Fuel.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l. cr.	**Colmar** (*ex*-Kolberg)	4280	402	46	16½	30,000 *t* (tur.)	Danzig (Schichau)	1908	1910	380,870	..	2	6 *5·9-in.*, 4 *3·4-in.* (Rearmed 1916).	2 (sub.)	26·3 *t*	890	379
„	**Duguay-Trouin**	7873	574	56	17	96,000	Brest	1923	..	..	..	..	8 *6-in.*, 6 l. & M.; 2 sea-planes	4 triple	34	oil	..
„	**La Motte Picquet**	7873	574	56	17	96,000	Lorient	Bldg.	..	..	..	..	8 *6 in.*, 6 l. & M.; 2 sea-planes	4 triple	34	oil	..
„	**Metz** (*ex*-Königsberg)	4200	450†	45	16	45,000	Bremen (Weser)	1915	1916	..	4–2½	1	7 *5·9-in.*, 3 *3·4-in.* A.A., 2 M.	4 (sub.)	28·5	1400	500
„	**Mulhouse** (*ex*-Stralsund)	4480	446¼†	43½	15¾	35,515 *t* (tur.)	Bremen (Weser)	1912	1913	416,340	4–2½	2	7 *5·9-in.*, 2 *3·4-in.* A.A., 2 M. (Rearmed)	2 (sub.)	28·27 *t*	1200	373
„	**Primauguet**	7873	574	56	17	96,000	Brest	Bldg.	..	..	..	..	8 *6-in.*, 6 l. & M.; 2 sea-planes	4 triple	34	oil	..
„	**Strasbourg** (*ex*-Regensburg)	4842	456†	45	17	26,000 (P. tur.)	Bremen (Weser)	1914	1915	417,810	4–2½	2	7 *5·9-in.*, 2 *3·4-in.* A.A., 2 M. (Rearmed)	2 (sub.)	27·5	1279	373
„	**Thionville** (*ex*-Novara)	3500	416¾	42	15½	25,000 (tur.)	Fiume	1913	1914	..	1	..	9 *3·9-in.*, 4 smaller	1	27·0	450 850	320

† Water-line.

During the war and subsequently the following sloops, despatch vessels, and gunboats (350-1250 tons, 17-22 knots) have been built: Algol, Altaïr, Aldebaran, Antarès, Bellatrix, Cassiopée, Régulus, Quentin-Roosevelt, Dubordieu, Dumont d'Urville, Du Couëdic, Du Chaffault, Duperré, Ancre, Ailette, Arras, Bapaume, Escaut, Marne, Oise, Somme, Coucy, Nancy, Amiens, Aisne, Epernay, Lunéville, Péronne, Mondemart, Montmirail, Reims, Verdun, Belfort, Epinal, Vauquois, Vimy, Vitry-le-François, Les Eparges, Lassigny, Remiremont, Revigny, Calais, Craonne, Liévin, Baccarat, Béthune, Scarpe, Suippe, Yser, Tahure, Dunkerque, Toul, Ville d'Ys, Meuse, and Chamois. In this series the vessels bearing the names of stars are sloops, and carry two 5·5-in. and two 6-prs.; the gunboats named after old seamen one 5·5-in. and one 3·9-in.; those named in honour of towns famed in the war two 5·5-in., one 12-pr. and 2 M.; and those bearing the names of rivers known in the war four 3·9-in. and five smaller. In addition are several older gun-vessels and 3 river gunboats built and two building. The despatch vessel Rheims is completing.

Twenty-four mine-trawlers of the Belliqueuse type, and a large flotilla of mine-trawlers. Submarine chasers fifty-four (internal combustion engines), fifteen (coal). Foudre, 5984 tons, repair ship.

Merchant Auxiliary Cruisers.—La France, 22,500 register tons, 235 knots, Touraine, 8429 register tons, 19·5 knots, Lorraine, 11,869 register tons, 21 knots, Savoie, 11,200 register tons, 22½ knots, of the Compagnie Générale Transatlantique, and some other vessels; also the Amazone, Magellan, Tonkin, and other 17 and 17½ knot boats of the Messageries Maritimes, and the Burdigala, 18 knots, and Lutetia, 20·5 knots, of the Sud Atlantique line.

GERMANY.

In the following list the letter R implies that the ships so marked are to be retained in reserve with their armament, but to have no ammunition on board.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns. The 12-prs. are field guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Braunschweig**	12,997	398½	73½	24½	16,000 T.S. & C.	Germania	1902	1904	1,157,500	9–4 K.S.	3	6 K.S.	6 K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 18 *3·4-in.*, 4 M., 1 *12-pr.*	5 (sub.)	18·0	700/1600	743
	Elsass	12,997	398½	72¾	24½	16,812 W.T.& C.	Danzig (Schichau)	1903	1905	1,157,500	9–4 K.S.	3	6 K.S.	6 K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 18 *3·4-in.*, 4 M., 1 *12-pr.*	5 (sub.)	18·7	800/1600	743
b.	**Hannover**	13,040	398½	73¾	25¼	22,492 T.S. *t.*	Wilhelmshaven	1905	1907	1,157,500	9½–4 K.S.	3	8 K.S.	6 K.S.	10–6 K.S.	6¾ K.S.	4 *11-in.*, 14 *5·9-in.*, 20 *3·4-in.*, 2 *12-pr.*, 4 M.	5 (sub.)	19·16 *t*	700/1800	743
b.	**Hessen**	12,997	398½	73¾	24½	16,000 T.S. & C.	Kiel (Germania)	1903	1905	1,157,500	9–4 K.S.	3	6 K.S.	6 K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 18 *3·4-in.*, 4 M., 2 *12-pr.*	5 (sub.)	18·0	800/1600	743
b.	R **Lothringen**	12,997	398½	73¾	24½	16,950 W.T.&C.	Schichau (Danzig)	1904	1906	1,157,500	9–4 K.S.	3	6 K.S.	6 K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 18 *3·4-in.*, 4 M.	5 (sub.)	18·54 *t*	800/1600	743
b.	R **Preussen**	12,997	398½	73¾	24½	18,374 W.T.& C.	Stettin	1903	1905	1,157,500	9–4 K.S.	3	6 K.S.	6 K.S.	10–6 K.S.	6 K.S.	4 *11-in.*, 14 *6·7-in.*, 18 *3·4-in.*, 4 M.	5 (sub.)	18·6 *t*	1574/1600	743
b. *b.*	**Schlesien** **Schleswig-Holstein**	13,040	398½	72¾	25¼	16,939 T.S. & C.	Schichau Germania	1906	1908	1,214,000	9½–4 K.S.	3	8 K.S.	6 K.S.	11–6 K.S.	6¾ K.S.	4 *11-in.*, 14 *5·9-in.*, 20 *3·4-in.*, 2 *12-pr.*, 4 M.	5 (sub.)	19·2 19·5 *t*	700/1800	743

The Hannover in the Baltic and the Braunschweig in the North Sea have been the only battleships in commission. The Lothringen and Preussen are out of the service.

Light cruisers Medusa, Thetis, and Amazone (2630 tons), completed 1901; Arkona, 1903; Hamburg, 1904; Berlin, 1905, all mounting ten *4·1-in.* guns. Also the Nymphe and Niobe (1899, 1901), these two to retain armament, but to have no ammunition on board. Both are now out of the service. The Arkona, Hamburg, and Berlin are alone considered to retain any real value, but nearly all the light vessels have been cruising. The light cruiser which is in hand at Wilhelmshaven, to replace an older vessel, is the Dresden, 5600 tons, length 508 ft. 6 ins., beam 46 ft. 9 ins., draught 16 ft. 4 ins., 29,000 h.-p., 8 *6-in.*, 3 *22-pr.*, 4 T.T.

Destroyers: S., 23; S., 18; G., 11, 10, 8, 7; V. 6, 5, 3, 2, 1; T. 196. In reserve (to retain armament), S. 19; T. 190, 185, 175.

Torpedo-boats: T. 168, 158, 157, 156, 154, 153, 151, 149, 146, 143, 141, 139. In reserve (to retain armament) T. 152, 148, 144, 135. Only about five of the torpedo-boats are accounted as other than obsolescent.

Surveying vessels Meteor and Panther. Gunboats Drache, Fuchs, Hay, Delphin.

GREECE.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a c.	**Giorgios Averoff** *See p.* 502.	9956	429¾	68¾	24¾	20,000 B	Leghorn (Orlando)	1910	1911	1,100,000	8–3½ K.S.	1¾	7	7	8–6½	7	4 *9·2-in.*, 8 *7·5-in.*, 16 *3-in.*, 8 *1·8-in.*	3 (sub.)	24·0	700 1600	..
b. *b.*	**Kilkis** (*ex* Mississippi) **Lemnos** (*ex* Idaho) *See p.* 502.	13,000	375	77	24¾	13,607 B.&W.	Philadelphia	1905	1908	616,360	9–4 K.S.	3½–1 K.S.	7 K.S.	7 K.S.	10–7½ K.S.	6 K.S.	4 *12-in.*, 8 *8-in.*, 8 *7-in.*, 12 *3-in.*, 14 smaller	2 (sub.)	17·1 *t.*	600 1750	725

The old battleships Hydra, Psara, and Spetsai are used in the training service.

GREECE.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
cr.	Helle (*ex* Fei-Hung)	2600	330	42	13	6500 tur.	Camden, N.J.	1912	1914	240,000	¾	..	2 *6-in.*, 4 *4-in.*, 4 *6-pr.*, 1 A.A.	2	22·5	..	..

Torpedo depôt-ship.—Kanaris, 1100 tons, 500 I.H.P., 2 3·9-in. (Krupp) guns, 14 knots speed. Mine-layers Aigialia, Monemvasia, Naupactia, Myconos. Five old gunboats and four corvettes. Three ex-British motor launches. Several armed merchantmen.

ITALY.—Armoured Ships.

Class.	NAME. DATE FOR SCRAPPING.*	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
															Gun Position.						
											Belt.	Deck.	Side above Belt.	Bulkhead.	Heavy Guns.	Second-ary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Andrea Doria** 1937	22,600	554⅓	92	29	32,000 P. tur. Y.	Spezia	1913	1915	..	10½–6 K.S.	1¾	6 K.S.	..	9½ K.S.	5 K.S.	13 *12-in.*, 16 *6-in.*, 13 *14-pr.*, 6 *14-pr.* A.A., 2 M., 4 L.	3 (sub.)	22	1000 2500	1074
b.	**Caio Duilio** 1936 *See p.* 503.						Castellammare	1913	1915												
b.	**Conte di Cavour** 1936 *See p.* 504.	22,023	554⅓	92	29	24,000 Parsons B. & W.	Spezia	1911	1915	..	9½–4½ K.S.	1¾	6 K.S.	..	9½ K.S.	5 K.S.	13 *12-in.*, 18 *4·7-in.*, 13 *14-pr.*, 6 *14-pr.* H.A.	3 (sub.)	22·0	1000	999
b.	**Dante Alighieri** 1931 *See p.* 505.	19,400	519⅔	85	27¼	35,000*t* Parsons Bl.	Castellammare	1910	1912	..	9½–4½ K.S.	1½	6 K.S.	..	10 K.S.	..	12 *12-in.*, 20 *4·7-in.*, 12 *14-pr.*, 6 *14-pr.* H.A.	3 (2 sub.)	23·0 *t*	1000 2500	900
b.	**Giulio Cesare** 1935 *See p.* 504.	22,023	554⅓	92	28	34,000 P. B.&W. P. Bl.	Genoa (Ansaldo)	1911	1914	..	9½–4½ K.S.	1¾	6 K.S.	..	9½ K S.	5 K.S.	13 *12-in.*, 18 *4·7-in.*, 13 *14-pr.*, 6 *14-pr.* H.A.	3 (sub.)	22·0 *t*	1000	999
b.	**Napoli**	12,425	485½	73½	27¼	20,000 B.&W.	Castellammare	1905	1909	1,120,000	9¾–4 H.S.	2	8 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 2000	711
a.c.	**Pisa** *See p.* 506.	10,600	462½	68¾	24¾	18,000 B.	Leghorn (Orlando)	1907	1908	..	8–3½ K.S.	1¾	7 K.S.	7 K.S.	7–6 K.S.	..	4 *10-in.*, 8 *7·5-in.*, 14 *14-pr.*, 6 *14-pr.* H.A.	3 (sub.)	23·0	700 1600	687
b.	**Roma**	12,425	485½	73½	27¼	20,000 B. & W.	Spezia	1907	1909	1,120,000	9¾–4 H.S.	2	8 H.S.	8 H.S.	8 H.S.	6 H.S.	2 *12-in.*, 12 *8-in.*, 12 *3-in.*, 12 *1·8-in.*	2 (sub.)	22·0	1000 2000	711
a.c.	**San Giorgio**	10,800	429¾	68¾	24¾	18000 Bl.	Castellammare	1908	1910	..	8–3½ K.S.	1¾	7 K.S.	7 K.S.	7–6 K.S.	7 K.S.	4 *10-in.*, 8 *7·5-in.*, 10 *14-pr.*, 6 *14-pr.* H.A.	3 (sub.)	22·5	700 1600	643
a.c.	**San Marco** *See p.* 506.	10,000				18000 tur.															

The Leonardo da Vinci, sister of the Giulio Cesare, was raised and taken into dock with the intention of reconstruction, but there is now no intention to complete her for service. She has been removed from the Italian Navy List. The old battleships Regina Elena and Vittorio Emanuele have also been removed, but the Napoli and Roma of the same class remain. The old armoured cruiser Francesco Ferruccio is now employed for the training of cadets. Monitor Faa di Bruno, 2,809 tons, 2 *15-in.*, 4 *14-pr.*, A.A. There are also four small river monitors, Monte Cengio, Monte Rovegno, Monte Grappa, and Montello, 575 tons, one *15-in.*, one machine-gun.

In the case of the Napoli and Roma the date of scrapping under the Treaty of Washington has not been indicated.

ITALY.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armaments.		Speed.	Fuel.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l. cr.	**Ancona** (*ex* German Graudenz) *See p.* 508.	4842	456	45	17	27,400	Kiel	1913	1914	..	..	..	7 *5·9-in.*, 2 *22-pr.*, 120 mines	4	27·5	1279	..
Scout	**Aquila**	1460	310	31	10½	39,800	Naples (Pattison)	1915	1916	..	..	..	3 *6-in.*, 4 *12-pr.* A.A., carries 100 mines	4	35·0	350 Oil	160
"	**Augusto Riboty**	1800	331	31·3	10½	43,100	Genoa (Ansaldo)	1915	1916	..	..	..	8 *4-in.*, 2 *12-pr.* A.A.; carries 100 mines	4	35·0	350 Oil	160
l. cr.	**Bari** (*ex*-German Pillau)	4320	441†	46	19½	27,400 turb.	Danzig (Schichau)	1914	1914	..	..	1	8 *5·9-in.*, 2 *3·4-in.* A.A. (Rearmed)	5	27·5	1000	..
"	**Brindisi** (*ex*-Austrian Helgoland) *See p.* 507.	3440	416¾	42	15½	25,000 Tur.	Fiume	1912	1914	..	1	..	9 *3·9-in.*, 1 *3-in.* H.A.	6	27·0	450 850	320
"	**Campania**	2444	250½	41·5	14·6	5000	Castellammare	1914	1916	..	1	..	6 *6-in.*, 5 l., 2 M	2	17·0	700	240
Scout	**Carlo Mirabello**	1800	331	31·3	10½	43,100	Genoa (Ansaldo)	1914	1916	..	..	..	8 *4-in.*, 2 *12-pr.* A.A.; carries 100 mines	4	35·0	350 Oil	160
"	**Falco**	1460	310	31	10½	38,100	Naples (Pattison)	1917	1918	..	..	..	3 *6-in.*, 4 *12-pr.* A.A.; carries 120 mines	2 dbl.	35·0	200	160
"	**Leone**	2158	359	33½	11¼	42,000 turb.	Genoa (Ansaldo)	Bldg.	..	..	..	..	8 *4 7-in.*, 2 *14-pr.* A.A., 2 M.; mining equipment	6	34·0	200 400	..
l. cr.	**Libia**	3690	341½	47	16	12,500	Genoa (Ansaldo)	1912	1913	..	1½	..	2 *6 in.*, 8 *4·7-in.*, 14 smaller	2	22·0	630	300
"	**Marsala.** *See p.* 507.	3600	430	42¾	13¼	22,500 P.tur.Bl.	Castellammare	1912	1914	..	1½	..	6 *4·7-in.* and 6 *14-pr.*, 2 *2-pr.* H.A., 150 mines	2	28·0	800	240

† Water line.

l. cr.	**Nino Bixio** *See p. 507.*	3600	430	42¾	13¼	22,500 Bl.Cur.t.	Castellammare	1911	1914	..	1½	..	6 *4·7-in.* and 6 *14-pr.*, 2 *2-pr.* H.A., 150 mines	2	28·0	800	300
Scout	**Pantera**	2158	359½	33½	11¼	42,000 turb.	Genoa (Ansaldo)	Bldg.	..	..	..	..	8 *4·7-in.*, 2 *14-pr.* A.A., 2 M., mining equipment	6	32·0	400 200	100
”	**Premuda** (*ex* German V. 116)	2500	360	36	14	4500 approx.	Hamburg	1918	1919	..	..	..	4 *5·9-in.*	4 *23·6 in.*	35·0	600 Oil	..
l. cr.	**Quarto** *See p. 508.*	3220	413½	43¾	13¼	29,000 P.tur.Bl.	Venice	1911	1912	..	1½	..	6 *4·7-in.* and 6 *14-pr.*, 2 *2-pr.* H.A., 150 mines	2	28·0	450	240
l. cr.	**Taranto** (*ex*-German Strassburg)	4480	446¼†	43½	15¾	33,742 *t* P. tur.	Wilhelmshaven	1912	1912	416,340	4-2½	2	7 *5·9-in.*, 2 *3·4-in.* A.A., 2 M. (Rearmed)	2 (sub.)	28·28 *t*	1200	373
Scout	**Tigre**	2158	359½	33½	11¼	42,000 turb.	Genoa (Ansaldo)	Bldg.	..	..	..	8	8 *4·7-in.*, 2 *14-pr.* A.A., 2 M., mining equipment	6	34·0	200 400	..
l. cr.	**Venezia** (*ex*-Austrian Saida) *See p. 507.*	3440	416¾	42	15½	25,000 Tur.	Monfalcone	1912	1914	..	1	..	9 *3·9-in.*, 1 *3-in.* H.A.	6	27·0	450 850	320

The scouts have been built to act also as flotilla leaders.

Etna (3474 tons), converted into a training ship. Eight mine-layers under construction, 600 tons, 10 knots, 200 mines: Albona, Laurana, Rovigno, ex-M. 130, 131, 132; Brondolo, Marghera, 115 tons, 13 knots. Nine mine-sweepers. Coal and liquid fuel transport Bronte (9490 tons); also Tevere, Prometeo, Cocito, Lete, Stige, Niobe, Cerrere; building Tarvisio, Quarnero, Istria, Dalmazia. Oil transport with under-water protection, Brennero. Anteo, submarine salvage vessel, 21,000 tons, 6 knots, raising 400 tons. Lagoon and river gunboats, Confida, Castore, Monte Santo, Vespa, Vodice, Ape, Cucco, Pasubio, Boeo, Cirenaica, Palmaiola, Toselli, Arimondi, S. Caboto, Alula, Calabria, E. Carlotto. Escort gunboats, A. Bafile, T. Farinati, E. Giovannini, C. del Greco, A. Vitturi. Surveying vessel, Ammiraglio Magnaghi, 1800 tons, 14 knots. About 50 various patrolling vessels and 10 gunboats. During the war a great number of motor chasers (M.A.S.) were bought and built, and at the beginning of 1921 about 350 of these were still on the list, but many have since been scrapped and sold. Transports Bengasi, Eritrea, Garigliano.

† Water line.

JAPAN.—Armoured Ships.

From this list the ships to be scrapped under the Washington Treaty, both those built and building, have been removed with one exception as a record.

Class.	NAME. DATE FOR SCRAPPING.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.†
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.						in.	in.	in	in.	in.	in.			knots.	tons.	
s.c.	**Akagi** *	33,000	850	..	..	170,000 (G.)	Kure Yokosuka	Bldg.	..	..	..	..	..	..	..	..	8 *16-in*	..	33·0	..	..
s.c.	**Amagi** *																				
b.	**Fuso** 1937 *See p.* 671.	30,600	630	94	28½	40,000 tur.	Kure	1914	1915	..	12 K.S.	3	6 K.S.	..	12 K.S.	6 K.S.	12 *14-in.*, 16 *6-in.*, 4 *12-pr.* A.A.	6 (sub.)	22·5	1500 4000	1193
b.	**Hyuga** 1940 *See p.* 510.	31,260	640	94	28½	45,000 tur.	Nagasaki (Mitsubishi)	1917	1918								12 *14-in.*, 20 *5·5-in.*, 4 *12-pr.* A.A.	6 (sub.)	23·0	1500 4000	1360
b.c.	**Haruna** 1935	27,500	653½	92	27½	64,000 My. P. t. My. C. t.	Kobe. (Kawasaki)	1913	1915	..	8–6 K.S.	2¾	..	..	10 K.S.	7 K.S.	8 *14-in.*, 16 *6-in.*, 4 *12-pr.*, A.A.	8 (sub.)	27·5	1000 4000	980
”	**Hiyei** 1935 *See p.* 512.						Yokosuka	1912	1914												
b.	**Ise** 1939 *See p.* 510.	31,260	640	94	28½	45,000 P. tur.	Kobe (Kawasaki)	1916	1917	..	12 K.S.	3	6 K.S.	..	12 K.S.	6 K.S.	12 *14-in.*, 20 *5·5-in.*, 4 *12-pr.* A.A.	6 (sub.)	23·0	1000 4000	1360
b.	**(Kaga** ‡**)**	40,600	700	..	..	..	Kobe (Kawasaki)	1921	..	..	14 K.S.	..	..	..	..	..	8 *16-in.*, 20 *5·5-in.*, 4 *12-pr.* A.A.	8	23·5	..	..

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* The seaplane or aircraft-carrying cruisers Akagi and Amagi are the former battle-cruisers of 40,000 tons, and of the same names, which names may be retained. Under the terms of the Treaty they are being converted into aircraft carriers. The Atago and Takao, of the same class, will not be laid down.

† The complements of Japanese ships vary considerably from time to time. These given are according to the latest reports.

‡ The name of the battleship Kaga, which is not to be completed, is retained here as a record. The other ship of the class was the Tosa. Both were 80 per cent. built.

b.c.	**Kirishima** . . 1936 *See p.* 512.	27,500	653½	92	27½	64,000 My P. t.	Nagasaki . (Mitsubishi)	1913	1915	..	8-6 K.S.	2¾	..	..	10 K.S.	7 K.S.	8 *14-in.*, 16 *6-in.*, 4 *12-pr.*, A.A.	8 (sub.)	27·5	$\frac{1100}{4000}$	980
”	**Kongo** . . . 1934 *See p.* 512.	27,500	653½	92	27½	64,000 Y. P. t.	Barrow .	1913	1913	2,500,000	8–6 K.S.	2¾	..	..	10 K.S.	7 K.S.	8 *14-in.*, 16 *6-in.*, 4 *12-pr.*, A.A.	8 (sub.)	27·5	$\frac{1100}{4000}$	980
b.	**Mutsu** * . 1942	33,800	660½	..	..	46,000 G.	Yokosuka	1920	1921	..	12 K.S.	..	..	..	..	..	8 *16-in.*, 20 *5·5-in.*, 4 *12-pr.* A.A.	8 (4 sub.)	23·0	..	1336
b.	**Nagato** . 1941 *See p.* 509.						Kure .	1919	1920												
b.	**Yamashiro** . . 1938 *See p.* 511.	30,600	630	94	28½	40,000 tur.	Yokosuka .	1915	1917	..	12 K.S.	3	6 K.S.	..	12 K.S.	6 K.S.	12 *14-in.*, 16 *6-in.*, 4 *12 pr.* A.A.	6 (sub.)	22·5	..	..

The battleship Aso (*ex*-Bayan), 8100 tons, completed at La Seyne in 1903, is now classed as a mine-layer.

The armoured-cruisers Kasuga and Nisshin, 7630 tons, and the cruisers Asama, Tokiwa, Suma, Adzuma, and Tsushima, were classified as coast-defence ships.

The battleships and armoured-cruisers (classified as battle-cruisers in the Appendix to the Washington Treaty), are being scrapped under the Washington Treaty. The Shikishima and Asahi may be retained as hulks for non-combatant purposes.

JAPAN.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
l.cr.	**Chikuma**	4950	440	46½	16¾	22,500 Cur. t. My.	Sasebo	1911	1912	..	2¼	..	8 *6-in.*, 4 *3-in.*, 4 M.	3	26	500 1000	413
”	**Hirado**	4950	440	46½	16¾	22,500 P. tur. My.	Kobe	1911	1912	..	2¼	..	8 *6-in.*, 4 *3-in.*, 4 M.	3	26	500 1000	390
a.c.	**Hosho**	9500	..	..	..	30,000 (G.)		1921	1922	..	..	..	4 *5·5-in.*, 2 *12-pr.* A.A.	..	..	..	..
l.cr.	**Abukama**	5500	500	46¾	15¾	90,000 (G.)	Uraga	1922	..	..	2	..	7 *5·5-in.*, 2 *12-pr.* A.A.	8	33·0	..	439
”	**Isudzu**						Uraga	1921	..								
”	**Kiso** *See p.* 513.						Nagasaki (Mitsubishi)	1920	1921								
”	**Kinu**						Kawasaki, Kobe	1922	1922								
”	**Kitakami** *See p.* 513.						Sasebo	1920	1921								
”	**Kuma** *See p.* 513.						Sasebo	1919	1920								
p.v.	**Mogami**	1350	300	31½	9¾	8000 turbines	Nagasaki	1908	1909	..	..	..	2 *4·7-in.*, 4 *12-pr.*	2	23·0	95 350	167
l.cr.	**Nagara**	5570	500	46¾	15¾	90.000 (G.)	Sasebo	1921	1921	..	2	..	7 *5·5-in.*, 2 *12-pr.* A.A.	8	33·0	..	439
”	**Natori**						Nagasaki (Mitsubishi)	1922	1922								
”	**Oh-i** *See p.* 513.	5500	500	46¾	15¾	90.000 (G.)	Kobe	1920	1921	..	2	..	7 *5·5-in.*, 2 *12-pr.* A.A.	8	33·0	..	439
”	**Tama** *See p.* 513.	5500	500	46¾	15¾	90.000 (G.)	Nagasaki (Mitsubishi)	1920	1921	..	2	..	7 *5·5-in.*, 2 *12-pr.* A.A.	8	33	..	439

„	**Tatsuta** . .	3500	440	41	13	51,000 (G.)	Sasebo .	1918	1919	..	..	..	4 *5·5-in.*, 1 *12-pr.* H.A. .	6	31	..	322
„	**Tenryu** . . *See p.* 513.						Yokosuka										
„	**Tone**	4100	400	47	16¾	15,000 My.	Sasebo . .	1907	1909	..	2½	..	2 *6-in.*, 10 *4·7-in.*, 2 *12-pr.*, 2 l.	3	23·0	300 900	401
l. cr.	**Yahagi** . . .	4950	440	46½	16¾	22,500 P. tur. My.	Nagasaki . .	1911	1912	..	2¼	..	8 *6-in.*, 4 *3-in.*, 4 M. . .	3	26	500 1000	413
p.v.	**Yodo**	1250	280	32	9¾	6500	Kobe . .	1907	1908	..	..	..	2 *4·7-in.*, 4 *12-pr.* . .	2	22·0	125 340	166
l. cr.	**Yura** . . .	5570	500	46¾	15¾	90,000 (G.)	Sasebo . .	1922	1922	..	2	..	7 *5·5-in.*, 2 *12-pr.* A.A. .	8	33	..	439

Light cruisers of the Kuma class, named Naka (damaged in the earthquake, but to be repaired and completed), Sendai, Jindzu, and Okuma, were laid down in 1922; also the Furutaka and Kako, and two projected (one said to be named Kinugasa), are of a larger class, 7100 tons, six 8 in. guns, four T.T. Four others are projected of a still larger class, 10,000 tons. Also building is the smaller cruiser Yubari, 3,300 tons, six 5·5-in., and four T.T.

Submarine depôt ships Karasaki (*ex*-Ekaterinoslav), 6170 tons, 5 light guns; Komahasi and Nagaura Maru. Seaplane carrier Wakamiya, 7600 tons. Aircraft carrier Hosho (details above); Shokaku, doubtful if building; also the ex-battle-cruisers Akagi and Amagi to be converted into aircraft carriers (see table of armoured ships).

Repair ship Kwanto Maru, 6190 tons. Colliers: Noshima, Maroto. Oil ships: Erimo, Notari, Shiretoko, Sunesaki Maru, Tsurugisaki.

Gunboats Saga, 780 tons, Uji, 620 tons.

River gunboats Toba, 250 tons; Fushimi, 180 tons; Sumida, 126 tons; Ataka, 850 tons, two 4·7-in. guns, and 2 M.; also Katata, Hira, Hodzu, and Seta, 820 tons, of the same class, completed 1923. Two 55-ft. C.M.B.'s with two 18-in. torpedoes. About 20 auxiliaries.

NETHERLANDS.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots	tons.	
a.g.b.	**Brinio** . . .	510	171	28	9¼	1200	Amsterdam .	1912 1913	1915	..	2 K.S.	¾	..	..	..	..	4 *4·1-in.* semi-automatic, 2 M.	..	14·5	34 Oil	52
,,	**Friso** . . .																				
,,	**Gruno** . . .																				
o.d.s.	**De Ruyter** . . *See p.* 514.	5000	316¾	51½	19	6377 *t.*	Rotterdam .	1901	1904	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	3 H.S.	2 *9·4-in.*, 6 *5·9-in.*, 4 *2·9-in.*, 4 *1·4-in.*	3 2 sub.	14·5 *t*	830	347
,,	**Hertog Hendrik** . *See p.* 514.	5000	316¾	50	19	6282 *t.*	Amsterdam .	1902	1903	347,500	6 H.N.S.	2	..	..	10 H.N.S.	3 H.S.	2 *9·4-in.*, 6 *5·9-in.*, 4 *2·9-in.*, 4 *1·4-in.*, 2 M.	3	14·5	830	347
,,	**Jacob van Heemskerck**	4921	316¾	50	19	6396 *t.*	Amsterdam .	1906	1908	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	6 H.N.S.	2 *9·4-in.*, 6 *5·9-in.*, 6 *2·9-in.*, 4 *1·4-in.*, 2 l.	3 2 sub.	14·5	610	351
,,	**Marten Tromp** . *See p.* 514.	5216	330	50	18¾	6405 *t*	Amsterdam .	1904	1906	347,500	6–4 H.N.S.	2	..	..	10 H.N.S.	3 H.S.	2 *9·4-in.*, 4 *5·9-in.*, 8 *2·9-in.*, 4 *1·4-in.*, 2 M.	3 2 sub.	14·5 *t*	830	349
,,	**De Zeven Provincien**	6426	339½	56	20¼	8516 Y	Amsterdam .	1909	1910	..	6–4 K.S.	2	..	..	10 K.S.	4 K.S.	2 *11-in.*, 4 *5·9-in.*, 10 *2·9-in.* semi-auto., 2 M.	..	15·3	1030	409

The Zeven Provincien is assigned to the Fleet of the Dutch East Indies. The light cruisers Java and Sumatra, intended for service in the East Indies, are building respectively at Flushing and Amsterdam. The Sumatra was launched at Amsterdam on December 30, 1920, the Java August 21, 1921, 7050 tons, 65,000 H.P., 30 knots, ten 6-in., four 3-in. guns. Light cruisers: Gelderland (1900), 4030 tons, now used as gunnery school; Zeeland (1897), 3900 tons, two 5·9-in., eight 4·7-in., two 2·9-in., four 1·4-in., 2 M., 19·4 knots. Four gunboats for the defence of the Zuyderzee. There are six modern mine-layers, Medusa, Hydra, Kotei, and Mataram, and Van Meerlant and Douwe Aukes, 750 tons, three 2·9-in. semi-auto., completed 1922; two others, Havik and Vulcanus, and six old vessels converted to the same use. Four mine-sweepers (I.–IV.), 275–300 tons, 1 machine-gun. In 1923 two old gunboats are in commission in the East Indies, and there are four mine-layers, Assahan, Serdang, Siboga, and Hercules. Surveying vessels in the East Indies, Van Gogh, Van Doorn, Lombok, Sumbawa, Tydeman. Depôt ship for submarines (Pelikaan), 2487 tons, four 2·9-in. semi-auto., 3 M., speed 12 knots, completed August, 1922 (East Indies).

NORWAY.—Armoured Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			in.	in.			knots.	tons.	
c.d.s.	**Eidsvold** **Norge** *See p.* 514.	4233	290	50½	16½	4500 Y.	Elswick	1900	1901	350,000	6 H.N.S.	2	..	..	6 H.N.S.	6 H.N.S.	2 *8·2-in.* 6 *6-in.*, 8 *12-pr.*, 6 *3-pr.*	2 sub.	16·9 *t*	400 600	270
„	**Harald Haarfagre**	3920	280	48½	16½	3700	Elswick	1896	1898	300,000	7 H.S.	2	..	..	8 H.S.	..	2 *8-in.*, 6 *4·7-in.*, 6 *12-pr.*, 6 *1½-pr.*	2 sub.	17·2 *t*	200 500	249
„	**Tordenskjold**							1897	1899												

Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.b.	**Æger**	387	108½	29½	8	450	Horten	1892	1893	..	1½	..	1 *8·2-in.*, 1 *2·7-in.*, 2 *1·9-in.*	..	9·0	..	43
g.b.	**Frithjof** (training)	1349	216½	32¾	13¼	2800	Horten	1896	1898	..	..	..	2 *4·7-in.*, 6 *12-pr.*, 4 *1·4-in.*, 2 l.	3 sub.	15·0	120	166

Mine-layers Fröya (1916), 760 tons, 22 knots, 100 mines; Glommen and Laugen (1916), 350 tons, 10 knots, 50 mines; two old vessels refitted, 280 tons. Submarine depôt and repair ships Sarpen, refitted 1918, 1920 tons; Ellida, 1000 tons. Two oil transports.

SPAIN.—Armoured Ships.

Class	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Alfonso XIII.** . *See p.* 515.	15,500	459	78¾	25½	15,500Y. P. tur.	Ferrol .	1913	1916	..	9–4 K.S.	2–1	6–5 K.S.	6–3 K.S.	10 K.S.	6 K.	8 *12-in.*, 20 *4-in.*, 2 *3-pr.*, 2 l., 2 M.	..	19·5	1850	735
a.c.	**Cataluña** . .	7405	347¾	61	23¼	10,580	Cartagena .	1900	1908	600,000	12–10	2	..	12	10½	..	2 *9·4-in.*, 8 *5·5-in.*, 8 *6-pr.*, 2 l., 10 *1-pr.*	..	18 *t*	1178	546
,,	**Emperador Carlos V.** *See p.* 515.	9900	404	67	27½	15,000	Cadiz (Vea Murguia)	1895	1898	734,000	2	6½–2	2	..	10	2	2 *11-in.* (Hontoria), 8 *5·5-in.*, 4 *4·1-in.*, 10 *6-pr.*, 8 *1-pr.*, 2 M.. 2 l.	2	19·0	2008	583
b.	**España** * .	15,460	459	78¾	25½	15,500Y. P. tur.	Ferrol	1912	1913	..	9–4 K.S.	2–1	6–5 K.S.	6–3 K.S.	10 K.S.	6 K.	8 *12-in.*, 20 *4-in.*, 2 *12-pr.*, 2 *3-pr.*, 2 M.	..	20·0 *t*	1305	700
b.	**Jaime I.** . *See p.* 515.	15,700	433					1914	1915										20·2	1850	
b.	**Pelayo** . .	9733	341	65¼	25½	8000 Nic.	La Seyne .	1887	1888 1897	..	17¾	4	..	..	19¼	4 H.S.	2 *12·6-in.*, 2 *11-in.*, 9 *5·5-in.*, 2 l., 12 *6-pr.*, 9 *1-pr.*	3	16·0	676	620
a.c.	**Princesa de Asturias**	7427	347¾	61	23¾	11,791	Cadiz .	1896	1902	600,000	12–10	2	..	12	10½	..	2 *9·4-in.*, 8 *5·5-in.*, 8 *6-pr.*, 2 l., 10 *1-pr.*	..	18·0	1007	546

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* In September, 1923, the España went ashore at Cape Tres Forcas. She was lightened, but unexpected difficulties occurred, and a Liverpool firm was called in to assist in salving the vessel.

SPAIN.—Cruising Ships.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.		Armament.		Speed.	Coal.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	ins.				knots.	tons.	
g.b.	Bonifaz	787	213	30	9½	1100 Y	Cartagena	1911	1912	..	..	..	4 *14-pr.*, 2 M.	..	14·0	148	121
to.g.b.	Don Alvaro de Bazán	810	236	27	11¼	3577	Ferrol	1897	1899	..	..	..	6 *6-pr.* 2 *2½-pr.*, 2 M.	..	19·0	168	121
„	Doña María de Molina	810	236	27	11¼	3500	Ferrol	1896	1898				8 *6-pr.*				
l. cr.	Extremadura	2100	288	36	16¼	7000 T	Cadiz	1900	1902	..	2	..	8 *4-in.* (Vickers), 4 *6-in.*, 4 *1-pr.*	..	19·0	425	266
g.b.	Lauria	787	213	30	9½	1100 Y	Cartagena	1911	1912	..	..	..	4 *3-in.*, 2 M.	..	14·0	..	121
„	Laya								1911								
to.g.b.	Marqués de la Victoria	810	233	26⅔	11	2711	Ferrol	1897	1900	..	..	..	8 *6-pr.*, 2 M.	..	19·0	..	121
g.b.	Recalde	787	213	30	9½	1100 Y	Cartagena	1911	1911	..	..	..	4 *3-in.*, 2 M.	..	13·8	..	121
l. cr.	Reina Regente	5778	363	52½	16¼	11,000 W.T.	Ferrol	1906	1910	..	..	3	10 *5·9-in.*, 12 *2·2-in.*, 2 l., 8 *1-pr.*	..	19·5	1178	452
„	Victoria Eugenia	5590	462	50	15¾	25,000 P.T.	Ferrol	1920	1923	..	2 (1½ side)	..	9 *6-in.*, 4 *3-pr* A.A., 4 M., 1 l.	4 (sub.)	25·0	650 coal & oil	..
„	D. Blas Lezo Mendez Nuñez	4650	462	46	14½	30,000	Ferrol	Bldg.	..	..	..	..	6 *6-in.*, 4 *3-pr.*, 4 M.	4	29	..	..

Three coastal gunboats of 1500 tons and 18 knots are in hand at Ferrol.

Infanta Isabel, Hernán Cortés, Vasco Nuñez de Balboa, gun-vessels.

Light cruiser Rio de la Plata, 1773 tons, converted to a mine-layer. Light gunboats Perla and Cartagenera, and motor-launches, M. 1–6, 40 tons (1919). Boys' training ship Galatea (*ex*-Clarastella), 2500 tons, recently bought in Italy. Several mine-trawlers and auxiliaries. Submarine salvage vessel Canguru, 2100 tons (1916).

SWEDEN.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost.	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
c.d.b.	**Aeran**	3650	287	49¼	16·7	6500 Y.	Gothenburg	1901	1902	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 1 *1·4-in.*	2 sub.	17·2 *t*	330	300
”	**Dristigheten**	3620	285	48·5	17	5400 Y.	Gothenburg	1900	1901	..	8 K.S.	1⅞	..	..	8 N.S.	3¾ K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 1 *1·4-in.*	2 sub.	16·5	310	250
”	**Drottning-Victoria** *See p.* 516.	7605	396·7	61	21½	22,000 tur. Y.	Gothenburg	1917	1921	666,000	8–6 K.S.	1½	4 H.S.	..	8 K.S.	5 K.S.	4 *11-in.*, 8 *6-in.*, 6 *12-pr.*, 2 *2·2-in.*, 2 M.	2 sub.	22·0 *t*	350 800	450
a.c.	**Fylgia**	4980	377·6	48·5	20·6	12,440 Y. *t*	Stockholm	1905	1907	385,700	4 K.S.	2	..	..	5 K.S.	5 K.S.	8 *5·9-in.*, 14 *2·2-in.*, 2 *1·4-in.*	2 sub.	22·5 *t*	350 900	341
c.d.b.	**Gustav V.** *See p.* 516.	7605	396·7	61	21½	22,000 tur. Y.	Malmö	1917	1922	666,000	8–6 K.S.	1½	4 H.S.	..	8 K.S.	5 K.S.	4 *11-in.*, 8 *6-in.*, 6 *12-pr.*, 2 *2·2-in.*, 2 M.	2 sub.	22·0	350 800	450
”	**Manligheten**	3840	287	49¼	17·4	7400 Y.	Malmö	1903	1904	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 8 *2·2-in.*, 1 *1·4-in.*	2 sub.	17·0	400	300
”	**Oscar II** *See p.* 516.	4658	313·6	50·5	18	9000 Y.	Gothenburg	1905	1907	..	6 K.S.	2	6 K.S.	6 K.S.	7½ K.S.	5 K.S.	2 *8·2-in.*, 8 *6-in.*, 10 *2·2-in.*, 4 *1·4-in.*	2 sub.	18·0	350 500	339
”	**Sverige** *See p.* 516.	7605	396·7	61	21½	20,000 tur. Y.	Gothenburg	1914	1917	666,000	8–6 K.S.	1½	4 K.S.	..	8 K.S.	5 K.S.	4 *11-in.*, 8 *6-in.*, 6 *12-pr.*, 2 *2·2-in.*, 2 M.	2 sub.	22·0	350 800	450
”	**Tapperheten**	3990	287	49¼	17 7	6000 Y.	Malmö	1901	1903	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 1 *1·4-in.*	2 sub.	16·5	330	300
”	**Wasa**	3745	287	49¼	17	6000 Y.	Stockholm	1901	1902	..	7 K.S.	1⅞	..	..	7½ K.S.	5 K.S.	2 *8·2-in.*, 6 *5·9-in.*, 10 *2·2-in.*, 1 *1·4-in.*	2 sub.	16·5	330	300

All the ships are now rated as coast-defence battleships, with the exception of the Fylgia. Older coast-defence ships Oden, Thor, Niord (1897, 1899, 1899), 3715 tons, 2 9·8-in., 6 4·7-in. guns; Göta, 3400 tons, Thule, 3300 tons. Mine cruisers Clas Fleming, 1800 tons, 4 4·7 in., 20 knots, Edda; other mining vessels Sökaren, Sveparen, Sprängeren, and others. Torpedo gunboats Claes Horn, Jacob Bagge, Oernen, Psilander, 830 tons, 2 4·7-in., 4 2·2-in., 20 knots. Two gunboats, 512–589 tons. Depôt ships for submarines, Svea, 3300 tons, Skold, 600 tons.

UNITED STATES.—Armoured Ships.

With four exceptions, all the ships which are being scrapped under the Washington Treaty (Ch. II. sec. 2) have been removed from the following list. The exceptions are the South Dakota battleship, and the Constellation, battle-cruiser, which are temporarily retained here as representing the ships of these classes, and the battle-cruisers Lexington and Saratoga, which are being converted into aircraft carriers under the provisions of the Treaty. The other ships of the South Dakota class were the Massachusetts, Iowa, North Carolina, Montana, and Indiana. The battle-cruisers to be scrapped are the Constellation, Ranger, Constitution, and United States. Old battleships of the second line being scrapped, 17 in all, are 6 of the Connecticut class, 5 of the Georgia class, the Michigan and South Carolina, and four others, which have long been out of the lists, Oregon, Illinois, Maine, and Missouri.

Class.	NAME DATE FOR SCRAPPING.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. §	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
b.	**Arizona** . 1937 *See p.* 530.	31,400	596	97	28¾ †	34,000 B. & W. P. tur. (G.)	New York (Navy Yard)	1915	1916	1,485,000	14 K.S.	3	..	..	18 K S.	..	12 *14-in.* (45 cal.), 14 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	2 (sub.)	21·0	2914 Oil	1002
b.	**Arkansas** . 1935 *See p.* 533.	26,000	554	93¼	28½ †	28,533 P. tur.	Camden, N.J. (N.Y.S.B.Co.)	1911	1912	964,000	11–5 K.S.	3	..	8–6 K.S.	11 K.S	6½	12 *12-in.*, 16 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	2 (sub.)	20·5 *t*	1650 2500	1115
b.	**California** 1941 *See p.* 518.	32,300	600	97½	30¼	28,500 Tur. (G.)	Mare Island (Navy Yard)	1919	1921	..	14 K.S.	..	..	..	18 K.S.	9 K.S.	12 *14-in.* (50 cal.), 12 *5-in.*, 8 *14-pr.* A.A., 4 *6-pr.*	2 (sub.)	21·0	2914 Oil	1167
a. c.	**Charleston** .	9700	424	66	35 †	27,500 B.&W.	Newport News	1904	1906	563,030	4 H.S	3	4 H.S.	..	4 H.S.	..	12 *6-in.*, 4 *3-in.*, 2 *3-in.* A.A., 10 M., 2 l.	..	22·0	650 1500	664
a. c.	**Charlotte** (*ex* North Carolina)	14,500	502	72¾	25 ‡	29,785 B. & W.	Newport News	1906	1908	970,630‡	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 4 *6-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 15 M. & 1.	4 sub.	21·9 *t*	900 2000	845
b.	**Colorado** . 1942 *See p.* 517.	32,600	600	97½	30½ †	28,900 B. & W. tur.	N.Y.S.B. Co.	1921	1923	1,383,000	16–14 K.S.	..	..	..	18 K.S.	9 K.S.	8 *16-in.* (45 cal.), 12 *5-in.*, 8 *3-in.* A.A., 4 *6-pr.*	2 (sub.)	21·0	2914 Oil	1167

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§ The sums given in this column are exclusive of the cost of armour and armament according to the system of making appropriations in the estimates.

† Mean draught.

‡ Including armour, but not armament.

UNITED STATES.—Armoured Ships—*continued.*

Class.	NAME. DATE FOR SCRAPPING.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. $	Armour.						Armament.		Speed.	Coal.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position.		Guns.	Torpedo Tubes.			
															Heavy Guns.	Second-ary.					
		tons.	ft.	ft.	ft.						in.	in.	in.	in.	in.	in.			knots.	tons.	
b.c.	(Constella-tion)	43,500	850	105½	31 †	180,000 tur. electric	Newport News	..	..	..	(will	not be	comp	leted)	..	..	8 *16-in.* (50 cal.), 16 *6-in.*, 4 *3-in.* A.A., 4 *6-pr.*	8 (4 sub.)	33·3	Oil	1315
b.	**Delaware** . 1923	20,000	510	85¼	27 †	28,578 B. & W.	Newport News	1909	1910	817,300	11 K.S.	..	10–8 K.S.	..	11 K.S.	5 K.S.	10 *12-in.*, 14 *5-in.*, 2 *3-in.* A.A., 16 M. & l.	2 (sub.)	21·5 *t*	1000 2500	927
b.	**Florida** . . 1934 *See p.* 524.	21,825	510	88¼	28½ †	27,036 B. & W. P. tur.	New York . (Navy Yard)	1910	1911	1,280,000	11	..	10	..	11	5	10 *12-in.*, 16 *5-in.*, 8 *3-in.* A.A., 6 *3-pr.*	2 (sub.)	20·75 *t*	1000 2300	1014
a.c.	**Frederick** . (*ex* Maryland)	13,680	502	69½	24½	28,059 B. & W.	Newport News	1903	1905	756,400	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 14 l.	2 (sub.)	22·4 *t*	900 1850	829
a.c.	**Huntington** . (*ex* West Virginia)	13,680	502	69½	24½	31,437 B. & W.	Newport	1903	1905	798,310	6–3½ K.S.	4	5 K.S.	12 H.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in* A.A., 8 *1-pr.*, 4 M., 1 l.	2 (sub.)	22·1 *t*	900 2000	829
a.c.	**Huron** . . (*ex* South Dakota)	13,680	502	69½	26	28,598 B. & W.	S. Francisco.	1904	1907	770,570	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 7 *1-pr.*, 1 l.	2 sub.	22·0 *t*	900 2000	829
b.	**Idaho** . . 1939 *See p.* 519	32,000	600	97¾	30 †	32,000 B. & W. P. tur. (G.)	Camden, N.J. (N. Y.S.B. Co.)	1917	1919	1,485,000	14 K.S.	3	..	..	18 H.S.	..	12 *14-in.* (50 cal.), 12 *5-in.*, 8 *14-pr.* A.A., 4 *3-pr.*	2 (sub.)	21·0	2914 Oil	1167
S.C.	**Lexington** .	33,000 approx.	..	..	.. †	180,000 tur.electric	Quincy, Mass.	..	..	..	..	..	..	..	..	..	10 *8-in.* (?)	..	..	..	..

b.	**Maryland** . 1941 *See p.* 517.	32,600	600	97¼	30½ †	28,900 T.	Newport News	1920	1921	1,383,000	16–14 K.S.	..	..	..	18 K.S.	9 K.S.	8 *16-in.* (45 cal.), 12 *5-in.*, 8 *3-in.* A.A., 4 *6-pr.*	2 (sub.)	21·0	2914 Oil	1167
b.	**Mississippi** . 1938 *See p.* 519.	32,000	600	97⅜	30 †	32,000 B. & W. Cur. t. (G.)	Newport News	1917	1917	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.* (50 cal.), 12 *5-in.*, 8 *14-pr.* A.A., 4 *6-pr.*	2 sub.	21·0	2914 Oil	1167
a.c.	**Missoula** . (*ex* Montana)	14,500	502	72⅞	27 †	27,938 B. & W.	Newport News	1906	1908	970,630‡	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 4 *6-in.*, 2 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 10 *1-pr.*, 4 M., 1 l.	4 sub.	22·2 *t*	900 2000	845
b.	**Nevada** . 1936 *See p.* 521.	27,500	575	95	28½ †	23,312 Y. Cur. tur.	Quincy, Mass. (Fore River)	1914	1915	1,211,342	13½–8 K.S.	1½–3	13½–8 K.S.	13½ K.S.	18–16 K.S.	5 K.S.	10 *14-in.* (45 cal.), 12 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	2 sub.	20·5	1300 2000	..
b.	**New Mexico** . 1939 *See p.* 519.	32,000	600	97¾	30 †	27,500 B. & W. Electric drive	New York . (Navy Yard)	1917	1918	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.* (50 cal.), 12 *5-in.*, 8 *14-pr.* A.A., 4 *6-pr.*	2 (sub.)	21·0	2914 Oil	1167
b.	**New York** . 1935 *See p.* 522.	27,000	565	95¼	28½ †	29,687 B. & W.	New York . (Navy Yard)	1912	1914	1,315,114	12–4 K.S.	3	9 K.S.	10 K.S.	14–8 K.S.	6 K.S.	10 *14-in.* (45 cal.), 16 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	4 sub.	21·5	2200 2850	1074
b.	**North Dakota**. 1923	20,000	510	85¼	28¾ †	31,000 B. & W. Cur. tur.	Quincy, Mass. (Fore River)	1908	1910	899,500	11 K.S.	..	10–8 K.S.	..	11 K.S.	5 K.S.	10 *12-in.*, 14 *5-in.*, 2 *3-in.* A.A., 2 *3-pr.*, 14 l., 4 M.	2 sub.	21·0 *t*	1000 2500	960
b.	**Oklahoma** . 1936 *See p.* 521.	27,500	575	95	29¾ †	21,703 B. & W.	New York .	1914	1915	2,200,000	13½–8 K.S.	1½–3	13½–8 K.S.	13½ K.S.	18–16 K.S.	5 K.S.	10 *14-in.* (45 cal.), 12 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	2 sub.	20·5	1300 2000	..
b.	**Pennsylvania**. 1937 *See p.* 520.	31,400	596	97	29¾ †	31,500 B. & W. Cur. tur.	Newport News	1915	1916	1,485,000	14 K.S.	3	..	..	18 K.S.	..	12 *14-in.* (45 cal.), 14 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	2 sub.	21·0	2914 Oil	1002
a.c.	**Pittsburg** .	13,680	502	69½	26	28,600 Nic.	Philadelphia (Cramp)	1903	1905	799,340	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 18 *1-pr.*, 8 M., 1 l.	2 sub.	22·4 *t*	900 2000	829

§ See note on page 453.

† Mean draught.

‡ Including armour, but not armament.

UNITED STATES.—Armoured Ships—*continued.*

Class.	NAME. DATE FOR SCRAPPING.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. §	Armour.						Armament.		Speed.	Normal Coal Supply.	Complement.
											Belt.	Deck.	Side above Belt.	Bulkhead.	Gun Position. Heavy Guns.	Gun Position. Second-ary.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.	in.	in.	in.	in.			knots.	tons.	
a. c.	**Pueblo** (*ex* Colorado)	13,680	502	69½	24½	26,837 Nic.	Philadelphia	1903	1905	756,000	6–3½ K.S.	4	5 K.S.	4 K.S.	6 K.S.	5 K.S.	4 *8-in.*, 4 *6-in.*, 10 *3-in.*, 2 *3-in.* A.A., 4 *3-pr.*, 12 *1-pr.*, 4 M., 1 l.	2 (sub.)	22·2 *t*	900 2000	829
a.c.	**St. Louis**	9700	424	66	22½ †	27,264 B. & W.	Philadelphia (Cramp)	1905	1906	563,030	4 K.S.	3	4–3	..	4 K.S.	..	12 *6-in.*, 4 *3-in.*, 2 *3-in.* A.A., 2 *3-pr.*, 12 l. & M.	..	22·1 *t*	650 1500	664
S.C.	**Saratoga**	33,000 approx.	..	..	.. †	180,000 tur.electric	N.Y. Ship- building Co.	..	..	..	..	..	..	..	..	..	10 *8-in.* (?)	..	..	..	..
a.c.	**Seattle** (*ex* Washington)	14,500	502	72¾	27	27,152 B. & W.	Camden, N. J.	1905	1906	970,630‡	5–3 K.S.	3	5 K.S.	6 K.S.	9 K.S.	5 K.S.	4 *10-in.*, 4 *6-in.*, 12 *3-in.*, 2 *3-in.* A.A., 4 *6-pr.*, 4 M., 11 l.	4 sub.	22·3 *t*	900 2000	858
b.	**(South Dakota)**	43,200	660	106	33 †	60,000 tur.electric	New York Navy Yard	..	..	(will not	be co	mplet	ed)	..	..	..	12 *16-in.* (50 cal.), 16 *6-in.*, 4 *3-in.* A.A.	2 (sub.)	23·0	Oil	1470
b.	**Tennessee** 1940 *See p.* 518.	32,300	600	97¼	30¼ †	28,500 T.	New York Navy yard	1919	1920	..	14 K.S.	..	..	..	18 K.S.	9 K.S.	12 *14-in.* (50 cal.), 12 *5-in.*, 8 *14-pr.* A.A., 4 *6-pr.*	2 sub.	21·0	2941 Oil	1167
b.	**Texas** 1935 *See p.* 522.	27,000	565	95¼	28½ †	28,100 B. & W. *t*	Newport News	1912	1914	1,166,000	12–4 K.S.	3	9 K.S.	10 K.S.	14–8 K.S.	6 K.S.	10 *14-in.* (45 cal.), 16 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	4 sub.	21·0 *t*	2200 2850	1074

b.	**Utah** . . 1934 *See p.* 524.	21,825	510	88¼	28½	28,477 B. & W. *t.* P. tur	Camden, N.J.	1909	1911	813,500	11	..	10	..	11	5	10 *12-in.*, 16 *5-in.*, 8 *3-in.* A.A., 4 *3-pr.*	2 sub.	20·75 *t*	1000 2300	1014
b.	**West Virginia** 1942 *See p.* 517.	32,600	600	97¼	30½ †	28,900 T.	Newport News	1921	1923	1,383,000	16–14 K.S.	..	..	..	18 K.S.	9 K.S.	8 *16-in.* (45 cal.), 12 *5-in.*, 8 *3-in.* A.A., 4 *6-pr.*	2 sub.	21·0	2841 Oil	1167
b.	**Wyoming** . 1934 *See p.* 523.	26,000	554	93¼	29¾ †	31,437 B. & W. P. tur	Philadelphia	1911	1912	963,800	11-9 K.S.	..	..	8–6 K.S.	11 K S.	8	12 *12-in.*, 16 *5-in.*, 8 *3-in.* A.A., 6 *3-pr.*	2 sub.	20·5 *t*	1650 2500	1115

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§ See note on p. 453.

† Mean Draught.

‡ Including armour, but not armament.

UNITED STATES.—Cruising Ships, &c.

Class.	NAME.	Displacement.	Length.	Beam.	Draught.	Indicated Horse-Power.	Where Built.	Date of Launch.	Date of Completion.	Cost. $	Armour.		Armament.		Speed.	Normal Coal Supply.	Complement.
											Deck.	Gun Position.	Guns.	Torpedo Tubes.			
		tons.	ft.	ft.	ft.					£	in.	in.			knots.	tons.	
g.v.	**Asheville**	1575	225	41¼	11¼†	800 P. tur.	Charleston	1918	1919	176,718	..	..	3 *4-in.*, 2 *3-pr.*	..	12	..	157
scout cr.	**Birmingham**	3750	420	47	18¾†	15,670 Express	Quincy, Mass.	1907	1908	301,000	2–1½	..	4 *5-in.*, 2 *3-in.*, 1 *3-in.* A.A., 4 M.	2 sub.	24·3 *t*	$\frac{1250}{1433}$	356
p.v.	**Chattanooga**	3200	292	44	17	5303 B.& W.	Elizabeth Port	1903	1904	212,325	2	..	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 2 M., 1 l.	..	16·65 *t*	$\frac{470}{700}$	302
scout cr.	**Chester**	3750	420	47	18¾†	16,000 Nor. turb.	Bath, Me.	1907	1908	337,000	2–1½	..	4 *5-in.*, 2 *3-in.*, 1 *3-in.* A.A., 4 M.	2 sub.	26·5 *t*	$\frac{1250}{1433}$	356
,, ,,	**Cincinnati** **Concord** *See p.* 525.	7500	550	55	19†	90,000	Tacoma, Wash. Philadelphia (Cramp)	1921	1923	Cost and fee	..	..	12 *6-in.*, 4 *3-in.* A.A., 2 *3-pr.*	2 twin and 2 triple above water 21-in.	33·7	Oil.	356
p.v.	**Cleveland**	3200	292	44	17	4640 B.&W.	Bath, Me.	1901	1903	212,325	2	..	6 *5-in.*, 1 *3-in.* A.A., 2 *1-pr.*, 2 M., 1 l.	..	16·4 *t*	$\frac{470}{700}$	302
p.v. ,,	**Denver** **Des Moines**	3200	292	44	17	4135 B. & W.	Philadelphia Quincy, Mass.	1902	1904	212,325	2	..	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 4 M., 1 l.	..	16·65	$\frac{470}{700}$	303
scout cr.	**Detroit** *See p.* 525.	7500	550	55	19†	90,000	Quincy, Mass. (Bethlehem)	1923	1923	Cost and fee.	..	..	12 *6-in.*, 4 *3-in.* A.A., 2 *3-pr.*	2 twin and 2 triple above water 21-in.	33·7	Oil.	356
p.v.	**Galveston**	3200	292	44	17	5073 B. & W.	Richmond, Va.	1903	1904	212,325	2	..	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 4 M., 1 l.	..	16·4	$\frac{470}{700}$	302

scout cr.	**Marblehead** **Memphis** . *See p.* 525.	7500	550	55	19†	90,000	Philadelphia (Cramp)	Bldg.	..	Cost and fee	..	..	12 *6-in.*, 4 *3-in.* A.A.; 2 *3-pr.*	2 twin and 2 triple above water 21-in.	33·7	Oil	356
,,	**Milwaukee** . *See p.* 525.	7500	550	55	19†	90,000	Tacoma, Wash.	1921	1923								
scout cr.	**Omaha** .	7500	550	55	19†	90,000	Tacoma, Wash.	1920	1922	Cost and fee	..	..	12 *6-in.*, 4 *3-in.* A.A.; 2 *3-pr.*	2 twin and 2 triple above water 21-in.	33·7	Oil	356
,,	**Raleigh** .						Quincy, Mass.	1922	..								
,,	**Richmond** . *See p.* 525.						Philadelphia (Cramp)	1921	1923								
p.v.	**Sacramento** .	1425	225	40¾	11½	1022	Philadelphia	1913	1914	101,200	..	..	8 *4-in.*, 2 *3-pr.*, 2 M., 2 l.	..	12·8 *t*	428	156
scout cr.	**Salem** .	3750	420	47	18¾	22,242 W.T. turb.	Quincy, Mass.	1907	1908	301,000	2–1½	..	4 *5-in.*, 2 *3-in.*, 1 *3-in.* A.A., 2 M.	2 sub.	25·9 *t*	1250 1433	356
p.v.	**Tacoma** .	3200	292	44	17	5288 B.&W.	S. Francisco	1903	1904	212,325	..	2 shields	6 *5-in.*, 1 *3-in.* A.A., 4 *6-pr.*, 2 *1-pr.*, 4 M.	..	16·6 *t*	470 700	302
sc. cr.	**Trenton** . *See p.* 525.	7500	550	55	19†	90,000	Philadelphia (Cramp)	Bldg.	..	Cost and fee	..	..	12 *6-in.*, 4 *3-in.* A.A., 2 *3-pr.*	2 twin and 2 triple above water 21-in.	33 7	Oil	356

§ Prices exclusive of armament. † Mean draught.

Aircraft carriers Langley (*ex*-collier Jupiter), 19,360 tons, 7160 H.P. turbines and electric drive, four 5-in. guns, and carrying about 30 aeroplanes; also Wright (converted merchantman) and the *ex*-battle-cruisers Lexington and Saratoga, now being converted. Patrolling and gun vessels Helena, Nashville, Vicksburg, Wheeling, and Wilmington, 1000 to 1392 tons, launched 1895–97; thirteen others and 10 patrolling yachts. Gunvessel Tulsa building (sister of Asheville). About fifty patrol vessels (Eagles) and submarine chasers. Fleet seaplane tender Aroostook and others adapted. Mine-laying vessels Baltimore, San Francisco, and Shawmut, carrying 5-in. and small anti-aircraft guns. A large number of mine-sweepers and tugs. Submarine tenders Alert, Beaver, Bushnell, Camden, Fulton, Chicago, Rainbow, and Savannah. Destroyer depôt ships Black Hawk. Buffalo, Dixie, Dobbin, Leonidas, Meville, Panther, Prairie, and Whitney. Repair ships Topeka, Villalobos, Bridgeport, 7594 tons, Medusa, 10,000 tons, Prometheus and Vestal, 12,595 tons. Supply ships Arctic, Bridge, Rappahanock. Hospital ships Comfort, Mercy, Relief, and Solace. Ulysses and Achilles, colliers, for the Panama Canal. Twelve other colliers and 13 oilers. River gunboats Monocacy and Palos, completed 1914. C.M.B. 1922, 2 18-in. torpedoes or depth-charges and 4 M., another with 18-in. torpedoes and 2 M.

Training ships Olympia, 5870 tons; Chicago, 4500 tons. Torpedo experimental vessel Montgomery, 2089 tons.

SHIPS OF THE LESSER NAVIES.

Austria.—Patrol vessels: Neretva, Compo, Fogas and Pozsony.

Belgium.—The maritime affairs of Belgium are under the control of the Minister of National Defence, who is responsible for the administration of the defences by land, sea, and air. The nucleus of the Navy consists of the sloop *ex* Zinnia 16 knots, one 4·7-in. and two 12-prs., for fishery protection duties, and 14 *ex* German torpedo-boats, of which 11 were interned in Holland and 3 abandoned in November, 1918. These last have been named severally Prince Léopold, Prince Charles, and Princesse Marie José. Several of the others are now unfit for service.

Bulgaria.—Under the terms of the naval clauses of the Peace Treaty, Bulgarian warships of all classes, existing or under construction, were surrendered to the Allied and Associated Powers or broken up. All vessels are under the Ministry of Commerce for police and preventive duties; torpedo-boats Derzki, Khrabri, Smelyi, and Strogi, with some motor boats of little value.

China.—The naval situation is obscure. The Canton Government was understood to control the light cruisers Cha-Ho (Elswick, 1912, 2,600 tons, two 6-in., four 4-in., eight smaller guns), Hai Chi (Elswick, 1899, 4,300 tons, two 8-in., ten 4·7-in., twenty-two smaller guns), also Yu Chang and Hai Chen; the destroyers Chien Kang and Tung An (Elbing, 1912); the gunboats Yung Hsiang and Yung Peng; despatch vessel Wu Feng ; river gunboat Chu Yu (No. 2) and the transport Fu An. The following vessels, constituting the first squadron, are mainly based on Chefoo : light cruisers Hai Chou and Hai Yeng (Stettin, 1898, 2,954 tons, three 6-in., eight 4-in., twelve machine guns); destroyer Chien Kang; gunboat Yung Chi; despatch vessels Yung Chien and Lien Ching and some armed launches. Second Yangtse flotilla: torpedo vessels Chien An and Chien Wei; torpedo boats, Chang, Chen, Hu Chun, Hu E, Hu Peng, Hu Yung, Lieh, and Su; river gunboats Chiang Chen, Chiang Hsi, Chiang Kun, Chiang Li, Chiang Yuan, Chien Chung, Chu Chien, Chu Tai, Chu Tung, Chu Yu (No. 1), Kung Chen, Yung An, Li Chieh, and Li Sui (the two last named *ex* German boats); training ship Tung Chi. The Kuang Tung flotilla recently comprised ten torpedo boats (Lei Chen, Lei Chung, Lei Fu, Lei Kan (No. I), Lei Kan (No. 2), Lei Ken, Lei Kun, Lei Li, Lei Sun, and Lei Tui), but it is doubtful if all are efficient; also gunboats Chen Hang, Chen Tao, Fu Po, Kuang Chen, Kuang Chin, Kuang Heng, Kuang Li, Kuang Yuan, Lung Hsiang, and two others reported unfit for service; and river gunboats Chiang Ku, Chiang Kung, and Chiang Ta.

Colombia.—Gunboats, Chercinto, Bogota, Cauca, and four guardacostas. River gunboats, General Nerino and Esperanza, 400 tons.

Cuba.—Light cruiser, Cuba, 2055 tons, 3500 H.P. 18 knots, and the training ship Patria, 1220 tons, 16 knots; also 5 gunboats, 10 submarine chasers and 13 revenue cutters.

Czecho-Slovakia.—There are six patrol ships and certain tugs on river service.

Ecuador.—The torpedo cruiser Libertador Bolivar, mine-laying torpedo boat Tarqui, and special vessel Cotopaxi.

Egypt.—Sloop (*ex* Syringa), 1918, 1310 tons, 17 knots, two 4-in. guns. Nile stern-wheel gunboats Sultan, Sheikh, and Melik, 140 tons, Zafir, Fateh and Naseh, 128 tons; also the Abu Klea, Hafir, Metemmeh, and Tamai.

Esthonia.—With small but efficient naval forces the young Navy of Esthonia gallantly assisted the operations of Sir Walter Cowan, whereby the independence of Esthonia was secured. Rear-Admiral Johan Pitka was in command, and in token of the happy association King George conferred upon that officer the K.C.M.G. The Navy consists of destroyers Wambola (*ex* Kapitan Kingsbergen), 1600 tons, 29 knots, four 4-in. guns, 2 M, 9 T.T., and Lennuk (*ex* Avtroil), 1800 tons, 32 knots, five 4-in. guns, and one 12-pr., 9 T.T., with gunboats, launches and some other vessels, including the *ex* Russian gunboat Bobr, 875 tons, two 4·7-in. and four 12-pr. guns, completed in 1908, which has received the name of Lembit. One mine-layer, three sweepers, five ice-breakers, and Peipus Lake gunboats Ahti and Tartu.

Finland.—The *ex* Russian gunboat Gilyak, 875 tons, two 4·7-in. and four 12-pr. guns; patrol boats Klas Horn (*ex* Posadnik), Matti Kurki (*ex* Voevoda), Karjala (*ex* Filin), and Turunmaa (*ex* Orlan); also 3 *ex* Russian torpedo boats, and a submarine of little value, three transports, 2 motor boats, 5 ice-breakers.

Hayti.—Special service vessel, 17 December (*ex* S.Y. American), and three others.

Hungary.—Patrol vessels: Debreczen, Kecskemet, Siofok, Szeged, and 4 others; also 10 motor launches.

Jugo-Slavia.—River monitors on the Danube: Drava (*ex* Enns), Morava (*ex* Körös), Sava (*ex* Bodrog), Varda (*ex* Bosnia). At Cattaro a patrol vessel and 12 *ex* Austro-Hungarian torpedo (F. and T. classes) lightly armed, for police and preventive duties only; at Spalato, 2 mine-sweepers; at Cattaro, 16 seaplanes.

Latvia.—Gunboat Virsaitis (*ex* German M 68.)

Mexico.—Gun-vessels, Tampico and Vera Cruz (Elizabethport, New Jersey, 1902); displacement, 980 tons; armament, four 4-in. Q.F., six 6-pr.; 16 knots; fitted to serve as transports for 200 troops, and Bravo 1200 tons; 2600 I.H.P.; 17 knots (Leghorn, 1904). Training ship Zaragoza, 1200 tons, 1300 H.P., 15 knots, four 4·7-in. and four small Q.F. Two revenue cutters. A small aircraft establishment. On the Pacific side, two gunboats and a transport.

Peru.—Almirante Grau and Coronel Bolognesi, cruisers, 3200 tons; (Barrow, 1906); two 6-in., eight 14-pdr., eight 1¼-pdr.; 2 submerged torpedo tubes; 24 knots; also Lima (training.) Gunboat America. Destroyer, Rodriguez, 500 tons, and submarines, Ferré and Palacios, built Le Creusot, 1912–13. Three submarines, Arica, Tacna, and Tarapacá, have been built in Italy (Ansaldo). Five river launches, two vedettes, and a small seaplane establishment.

Poland.—The Polish Government hopes eventually to become possessed of a small Navy. The British Naval Mission was withdrawn. It is proposed that Poland shall be allowed six small cruisers and gunboats on the Vistula. She has been allotted six *ex* German torpedo boats for police purposes. Gunboats, Komendant Pilsudski, 500 tons, carrying several small guns, and General Haller, built in Finland. Training ship, Lwow. Monitors, Warszowa, Horodyszcre, Pinsk, Mozyrz, and some 15 minor vessels. About 30 *ex* Italian flying-boats, and 5 *ex* German aeroplanes.

Portugal.—The most considerable vessel in the Portuguese Navy was the cruiser Almirante Reis, now dismantled, completed at Elswick in 1899; 4100 tons, 12,000 H.P.; four 5·9-in., eight 4·7-in., fifteen smaller guns, five tubes; 22 knots. The Adamastor, 1962 tons, completed at Leghorn in 1897, and the São Gabriel at Havre in 1899, have as their chief armament, two 5·9-in. and four 4·7-in. guns. Eleven gunboats mainly for Mozambique and Timor. The minelayer Vulcano was built by Messrs. Thornycroft in 1909. There are other small boats, and several sloops sold out of the British Navy are being added. These are the Republica (*ex* Acacia), and Carvalho Araujo (*ex* Jonquil.) Portugal has the old destroyer Tejo and three modern, Douro, Guadiana, and Vouga (1912–18), 700 tons, 11,000 H.P., 20 knots, two tubes, also five *ex* Austrian F boats for police duties. Submarines Espadarte, 245–300 tons, 13 knots (F.I.A.T.), and Foca, Golfinho, and Hidra (Laurenti); 260–389 tons, 13–8·5 knots, 2 T.T. Seaplane establishments at Belem, Faro and Aviero. The gunboat Patria is at Lourenço Marques.

Roumania.—The Black Sea Force comprises the flotilla leaders Marasti and Maracesti, and the torpedo boats Vijelia, Sborul, Naluca, Zmeul, Vartejul, and Viforul, four *ex* French gunboats fitted as mine-layers, and six *ex* Italian motor launches. At Constanza and Sulina are the old protected cruiser Elizabeta, now a hulk, the mine-layer Alexandru-cel-Bun (104 tons), and some tugs; and at Galatz the pilots' school, two river transports and some tugs. The Danube flotilla comprises the monitors Ioan Bratianu, Alexandru Lahovary, Lascar Catargiu, Mihail Kogalniceanu, Besarabia, Bucovina, and Ardeal (600 tons, three 4·7-in guns), seven vedettes, and the yacht Macinul. Seven *ex* Austrian F and T torpedo boats were assigned to Roumania for police duties.

Russia.—The only battleship recently in commission in the Baltic was the former Petropavlovsk (23,000 tons, twelve 12-in. guns) re-named Marat, which flew the flag of the former lieutenant who is in command, but the Pariskaya Kommuna (*ex* Sevastopol) is in the reserve. The principal forces are destroyers and submarines. The first-class destroyers are the Garibaldi (*ex* Ilyn), Kapt. Izulmetiev, Azard, Samson, Desna, Zabiaka, Pobyeditel, and Izyaslav, and there are the second-class boats Likhoi, Lovki, Krepki, Dmitriev, Zvyerev, Vnimatelni, Vnushitelni, Vuinoslavi, and Myetki. The submarines are the Leopard, Tur, Volk, Zmeya, Pantera, Ruis, Tigr, Yaguar, Yersh, Kuguar, and Vipr. The yacht Neva is the leading ship with the flotillas. Other formations are the mine-sweeping division, transport vessels (6), surveying vessels (7), depôt ships (4), and ice-breakers (8). Recently in reserve, with reduced complements, was the battleship Sevastopol, sister of the Petropavlovsk, now named Pariskaya-Kommuna, with one mine-layer, two divisions of mine-sweeping trawlers, a flotilla of second-class destroyers, two motor boats, and some other vessels. Out of commission and unfit for sea are the two other Dreadnoughts, Poltava and Gangut, an older battleship, and a number of older destroyers, torpedo boats, and submarines, mine-layers and sweepers, patrolling vessels and transports, none of them likely to be of any use. One or more of the big ships went to Hamburg to be broken up. Other vessels belong to the gunnery, torpedo, and mining schools. There were some manœuvres in September, 1922.

In the Arctic, where a former rear-admiral is in command, there is a destroyer division comprising the Kapitan Yurasovski, Leit. Sergyiev, Bezhumny, and Bestrashny, the last two in reserve. With the destroyers are the yacht Gorislava, a mine-layer, four motor launches, and some patrol and trawling vessels. In reserve, and probably useless, is the old battleship Chesma. The submarines Kommunist (formerly Sviatoi Georgi) and Delphin, six submarine chasers, and a number of armed auxiliaries, harbour craft, ice-breakers, and patrol boats constitute an active force.

Some progress has been made with naval aircraft, which are based on Oranienbaum, Guteff Island, and Peterhof near Petrograd, and List Nos, near the Finnish border. In all there were about 55 'planes, of which 28 were flying boats, but now the total number of 'planes is said not to exceed 14

In the Black Sea no battleship is in commission. When Wrangel's forces evacuated Sevastopol on November 14, 1920, his fleet proceeded to Bizerta, where it is under French protection. Their future is uncertain. An account of the proceedings of Wrangel's fleet will be found in the "Annual," 1921–22, pp. 66 and 378. The ships in question are the Dreadnought General Alexeieff (*ex* Alexander III), the pre-Dreadnought Georgi Pobiedonosetz, two cruisers, General Korniloff and Almaz, 6 first-class and 3 second-class destroyers, 4 submarines and some auxiliaries.

The Soviet vessels in commission recently in the Black Sea were two divisions of destroyers, one of them (8 boats) fitted as mine-layers, comprising (1) the Bezposchadni, Bezstrashni, Bezumprechny, Bezshumny, Bravi, Bedovi, Buiny, Bodry; (2) Derzki, Delny, Jutki, Jarki, Jivoi, Jivuchi, Zorky, Zavidny, Prochny, Pronzitelny, Puilky, and Pruitky. There were also two other destroyers, three submarines A. G. 23 (Trotsky), A. G. 24 (Lunacharsky), and A. G. 25 (Kamenev), and mine-layers, armed vessels, patrol boats, repair ships, transports, etc. In reserve are 5 old battleships, of which all had their engines destroyed by explosion on April 25, 1919, and also a cruiser 3 destroyers, 1 submarine, 6 submarine-chasing destroyers, large forces of mine-layers based on Odessa, and 6 mine-carriers, 7 patrol boats, 4 ice-breakers, and numbers of armed vessels and auxiliaries. Some additional submarines were sent overland from the Baltic. A small flotilla is on the Dnieper, comprising armed steamers, patrol boats and motor boats.

In the Caspian and on the Volga, with headquarters at Baku, is a force of 14 second-class destroyers, 2 smaller patrolling craft and colliers and other vessels. In reserve are the submarines Kassatka, Makrel, Minoga, and Okun, reported to be of no value, some submarine chasers, and mine-sweepers, motor launches and other vessels.

In the Far East, at Vladivostok, are some 12 of the older destroyers. On the Amur there remain only about 6 useful river gunboats out of a flotilla of 25.

The Bolshevik aircraft in the Black Sea and the Caspian are based on Sevastopol, Odessa, Nigolaieff, Taganrog, Mariupol, Eisk, Novorissisk, Znzeli, and Baku, and number in all about 36, of which some 17 are said to be flying boats.

Santo Domingo.—The Independencia, built in England 1894, 322 tons, seven Hotchkiss Q.F. Four patrol vessels for revenue service.

Sarawak.—Gunboat Aline and steamboats Lorna Doone and Aden.

Siam.—The gunboats Bali and Sugrib, 600 tons, one 4·7-in. Q.F., five 2·2-in., four 1·4-in., 12 knots, launched 1898 and 1901. Three despatch vessels, 100 to 250 tons. Two 380-ton, 27-knot destroyers, built at Kobe, Sua Gamron Sindhu and Sua Tayanchou. Phra Ruan (*ex* British destroyer Radiant, 1917). A coastal motor boat is being built in England. There is no definite organisation of the Siamese ships and vessels, which occasionally cruise from Bangkok.

Turkey.—By the Treaty of Sèvres, Turkey was reduced to naval impotence. The yachts Ertougrul and Sugutli and a motor launch were at the Sultan's disposal, and two gunboats were released by the Allies for patrol duties in the Black Sea. Under the Treaty of Lausanne, Turkey returns to her place among the Powers. Some of the facts concerning naval dispositions are given on page 77.

Uruguay.—Light cruiser Monte Video, torpedo-cruiser Uruguay, built at the Vulcan Yard, Stettin; 1400 tons; two 4·7-in., four 12-pdr., twelve Maxims; two 18-in. torpedo tubes. Torpedo boat Oriental, yacht 18 de Julio, and some special vessels.

Venezuela.—Marescal Sucre (*ex* Isla de Cuba), drill ship bought from United States, 1912. Gunboats, General Salom, Miranda, José Felix Pribas, Antonio Diaz.

BRITISH AND FOREIGN FLOTILLAS.

Great Britain.

Name or Number.	Built by.	Completed.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Horse-Power.	Mean Speed on Trial, or expected.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
				FLOTILLA LEADERS.									
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons
Abdiel	Cammell Laird	1916	315	31·9	10	3	1610 to 1680	36,000	34	4-4 in. Q.F. 2-prs. (Abdiel 3-4-in.)	4	110 to 116	Oil. 515
Grenville	" "	1916											
Seymour													
Saumarez													
Nimrod	Denny	1915											
Shakespeare	Thornycroft	1917	318	31·9	10·6	2	1750	43,500	36·5	5-4·7 in. 1-3 in. A.A.	6	164	Oil. 500
Spenser	"	1917											
Wallace	"	1919											
Keppel	"	Bldg.											
Broke, *ex* Rooke	"	Bldg.											
Bruce	Cammell Laird	1918	320	31·9	10·6	2	1800	44,000	36·5	5-4·7 in. 1-3 in. A.A.	6	164	Oil. 500
Douglas													
Campbell													
Mackay, *ex* Claverhouse													
Malcolm													
Montrose	Hawthorn	1918											
Stuart	"	1919											

TORPEDO BOAT DESTROYERS.

"*R*" *Class*:—Rapid, Ready, Retriever, Rosalind, Taurus, Teazer (Thornycroft); Relentless, Rival, Sabrina, Sybille, Truculent Tyrant (Yarrow); Radstock, Raider, Sorceress, Torrid, Tower (Swan, Hunter); Redgauntlet, Rob Roy, Rocket (Denny); Redoubt, Umpire (Doxford); Restless, Rigorous, Romola, Rowena, Simoom, Skate, Tarpon, Telemachus (John Brown); Salmon, Sylph, Skilful, Springbok, Tenacious, Tetrarch (Harland and Wolff); Sable, Trenchant (White); Sarpedon, Starfish, Stork, Thisbe, Thruster (Hawthorn); Satyr, Sharpshooter, Tancred, Ulster (Beardmore); Sceptre, Sturgeon, Tormentor (Stephen); Tempest, Undine (Fairfield); Urchin, Ursa (Palmer); Ursula (Scotts).

Displacement, 883–1040 tons; length, 260–265 ft.; 26,500–27,000 H.P.; speed, 35–36 knots; armament, three 4-in., one 2-pdr., four torpedo tubes; fuel, 256–300 tons; complement, 82.

"*S*" *Class*:—Sabre, Saladin, Sardonyx (Stephen); Scimitar, Scotsman, Scout, Scythe, Seabear, Seafire, Searcher, Seawolf (John Brown); Senator, Sepoy, Seraph, Serapis, Serene, Sesame (Denny); Shamrock, Shikari (Doxford); Shark, Sparrowhawk, Splendid, Sportive, Tilbury, Tintagel (Swan, Hunter); Steadfast, Stirling, Stormcloud (Palmers); Strenuous, Stronghold, Sturdy, Swallow (Scotts); Tactician, Tara (Beardmore), Tenedos, Thanet, Thracian, Turbulent (Hawthorn); Torbay, Toreador, Tourmaline (Thornycroft); Tribune, Trinidad, Trojan, Truant, Trusty (White); Torch, Tomahawk, Tumult, Turquoise, Tuscan, Tyrian (Yarrow); Sirdar, Somme, Spear, Spindrift, Sikh (Fairfield).

Displacement, 885–1090 tons; length, 260–265 ft.; 27,000 H.P.; speed, 36 knots; armament, three 4-in., one 2-pdr., six torpedo tubes; fuel, 250–300 tons; complement, 90.

"*V*" *Class*:—Vancouver, Vanessa, Vanity (Beardmore); Vanoc, Vanquisher (J. Brown); Vectis, Vortigern (White); Vega, Velox (Doxford); Vendetta, Venetia (Fairfield); Venturous (Denny); Verdun, Versatile (Hawthorn); Vesper, Vidette (Stephen); Viceroy, Viscount (Thornycroft); Violent, Vimiera (Swan, Hunter); Vivacious, Vivien (Yarrow); Valkyrie, Valorous (Denny); Valentine, Valhalla (Cammell Laird); Vampire (White).

Displacement, 1275–1300 tons; length, 300 ft.; H.P., 27,000–30,000; speed, 34–35 knots; armament, four 4-in., one 3-in., four torpedo tubes; fuel, 367 tons; complement, 110.

"*W*" *Class*:—Voyager (Stephen); Wakeful, Watchman, Venomous, Verity, Veteran (J. Brown); Walker, Westcott, Volunteer (Denny); Walpole, Whitley (Doxford); Walrus, Wolfhound, Wanderer (Fairfield); Warwick, Wessex (Hawthorn); Westminster (Scotts); Wolsey, Woolston, Wishart, Witch (Thornycroft); Vansittart (Beardmore); Winchelsea, Winchester, Witherington, Wivern, Wolverine, Worcester (White); Whirlwind, Wrestler, Whitehall, Whitshed, Wild Swan (Swan, Hunter); Waterhen, Wryneck (Palmers); Wren (Yarrow).

Displacement, 1275–1350 tons; length, 300 ft.; H.P., 27,000; speed, 34 knots; armament, four 4-in., or four 4·7-in., and one 3-in.; six torpedo tubes; fuel, 365 tons; complement, 127.

SLOOPS.

Of the large number of sloops which were built during the War for patrol and other duties only about twenty now remain in the Post-War Fleet, some in commission abroad and others for subsidiary and training duties in home waters.

Names are as follow: Bluebell, Bryony, Clematis, Cornflower, Chrysanthemum, Crocus, Cyclamen, Daffodil, Delphinium, Foxglove, Godetia, Harebell, Heather, Heliotrope, Hollyhock, Laburnum, Lily, Lupin, Magnolia, Snapdragon, Valerian, Verbena, Veronica, Wallflower, Wistaria. Also Petersfield (*ex* mine-sweeper).

Displacement, 1250 tons; length, 255 ft.; H.P., 2400 (reciprocating); speed, 17 knots; armament, two 4-in., two 3-pdrs.; 260 tons of coal; complement, 93.

TWIN-SCREW MINE-SWEEPERS.

The following are retained in the Post-War Fleet:—

Aberdare, Abingdon, Alresford, Carstairs, Caterham, Fareham, Sherborne, Mistley, Burslem, Truro, Badminton, Bagshot, Tring, Leamington, Albury, Dorking, Dundalk, Dunoon, Elgin, Faversham, Fermoy, Ford, Forres, Gainsborough, Gretna, Harrow, Holderness, Huntley, Kendal, Lydd, Mallaig, Malvern, Marazion, Marlow, Nailsea, Newark, Northolt, Pangbourne, Ross, Rugby, Saltash, Saltburn, Selkirk, Shrewsbury, Southdown, Stafford, Stoke, Sutton, Tedworth, Tiverton, Tonbridge, Tralee, Wetherby, Weybourne, Widnes, Yeovil.

Most of the foregoing form a "Central Reserve of Twin-Screw Mine-sweepers." In addition, the following are employed on surveying duties:—

Beaufort, Fitzroy, Flinders, Kellet.

Displacement, 800 tons; length, 220 ft.; H.P., 2200; speed, 16 knots; armament, one 3-pdr.; 140 tons of coal; complement, 74.

Other surveying ships, of new types, are the Herald (*ex*-Merry Hampton), the Ormonde, and the Iroquois; and of old types, the Endeavour, Fantome, and Mutine. The two last-named are to be disposed of on relief by the Herald and Ormonde respectively.

PATROL BOATS.

The following are retained in the Post-War Fleet:—

P 22, P 31, P 38, P 40, P 46, P 47, P 53, P. 54, P 59, PC 60, PC 70, PC 71, PC 72, PC 73, PC 74.

Displacement, 573 tons; length, 230 ft.; H.P., 4000; speed, 22 knots; armament, one 4-in., one 2-pdr., two 14-in. tubes; oil, 93 tons complement, 54.

SUBMARINES.

"*E*" *Class*:—E 48.

Surface displacement, 660 tons, submerged, 800; surface H.P., 1600, submerged, 840; surface speed, 15 knots, submerged, 10 knots; oil, 45 tons; armament, one 4-in., four 18-in. tubes; complement, 30.

"*G*" *Class*:—G 4.

Surface displacement, 700 tons, submerged, 975; surface H.P., 1600, submerged, 840; surface speed, 14 knots, submerged, 10 knots; oil, 44 tons; armament, one 3-in., four 18-in., and one 21-in. tubes; complement, 30.

"*H*" *Class*:—H 21, H 22, H 23, H 24, H 25, H 26, H 27, H 28, H 29, H 30, H 31, H 32, H 33, H 34, H 43, H 44, H 47, H 48, H 49, H 50, H 51, H 52.

Surface displacement, 440 tons, submerged, 500; surface H.P., 480, submerged, 320; surface speed, 13 knots, submerged, 10½ knots; oil, 16 tons; armament, four 21-in. tubes; complement, 22.

"*K*" *Class*:—K 2, K 6, K 8, K 9, K 12, K 14, K 15, K 16, K 22, K 26.

Surface displacement, 1880 tons, submerged, 2650; surface H.P., 10,000, submerged, 1400; surface speed, 24 knots, submerged, 9 knots; oil, 200 tons; armament, one 4-in., one 3-in. A A., eight 18-in. tubes; surface propulsion by steam turbines; complement, 54.

"*L*" *Class*:—L 1, L 2, L 3, L 4, L 5, L 6, L 7, L 8, L 9, L 11, L 12, L 14, L 15, L 16, L 17, L 18, L 19, L 20, L 21, L 22, L 24, L 25, L 33, L 52, L 56, L 69, L 71. Building, L 23, L 26, L 27, L 53, L 54.

Surface displacement, 890 tons, submerged, 1070; surface H.P., 2400, submerged, 1600; surface speed, 17½ knots, submerged, 10½ knots; oil, 76 tons; armament, one 3-in. or 4-in., six 18-in. tubes. (L 52 and later boats have two 4-in. guns each.); complement, 38.

"*M*" *Class*:—M 1, M 2, M 3 (*ex*-K 18, K 19, and K 20). Surface displacement, 1600 tons, submerged, 1950; surface H.P., 2400, submerged, 1600; surface speed, 15½ knots, submerged, 9½ knots; oil, 76 tons; armament, one 12-in., one 3-in., one M., four tubes complement, 65.

"*R*" *Class*:—R 4, R 10.

Surface displacement, 420 tons, submerged, 500; surface H.P., 1200, submerged 240; surface speed, 15 knots, submerged, 9½ knots; oil, 13 tons; complement, 22.

"*X*" *Class*:—X 1; surface displacement, 2780 tons, submerged, 3600 tons. Building at Chatham. Other particulars uncertain.

Argentine Republic.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Corrientes	Yarrow ..	1896	190	19·6	7·4	2	280	4,000	27·4 *t.*	1 14-pr. 3 6-pr, Q.F., 2 M.	3	54	80
Missiones..	Yarrow ..	1896	190	19·6	7·4	2	280	4,000	26·0 *t.*		3	54	80
Entre Rios	Yarrow ..	1896	190	19·6	7·4	2	280	4,000	26·7 *t.*		3	54	80
Catamarca, Jujuy ..	Germania ..	1911	286·7	27·1	8·6	2	940	18,000	32	4 4-in.	4	110	300
Cordoba, La Plata ..	Schichau ..	1911	279	29·6	7·3	..	890	19,000	34·7	4 4-in.	4	110	340
FIRST CLASS—													
2 boats	Thornycroft	1890–1	150	14·5	5·2	2	110	1,500	24·52	3 3-prs.	3	27	22
2 boats	Yarrow ..	1890	130	13·5	6·0	1	85	1,200	23–24	2 3-pr. Q.F.	2	16	15

Brazil.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Para	Yarrow ..	1908	240	23·6	10	2	550	7,014	27·25	2 4-in., 4 3 prs.	2	..	140
Amazonas		1908						6,898	27·17				
Piauhy		1908						6,563	27·21				
Matto Grosso		1908						7,403	27·16				
Parahyba..		1909						6,700	27·29				
Rio Grande do N. ..		1909						7,778	27·27				
Alagoas		1909						7,403	27·25				
Santa Catharina ..		1909						6,982	27·30				
Parana		1910						8,877	28·74				
Sergipe		1909						8,554	27·60				
FIRST CLASS—													
Goyaz	Yarrow ..	1907	152·5	15·3	..	3	..	..	26·5	2–3 prs.	2	..	..
SUBMARINES—													
F 1, 3, 5	Muggiano (Fiat)	1914	150	14	9·8	..	250–375	..	14–8·5	..	2	..	..

Five additional destroyers and three submarines are in the programme. *Ex* British destroyer Porpoise, 950 tons, 1913, now named Almirante Alexandrino de Alencar.

Six *ex* German torpedo-boats were allotted to Brazil, to be used for police purposes. A Laurenti submarine salvage and testing vessel, named Ceará, 3800 tons, 328 ft. long, 50 ft. beam, 14 knots.

Chile.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Almirante Lynch, Condell	White	1912 1913	320	32·6	11·1	3	1850	27,000	31·7	6–4-in. 2 M.	4	..	507
Almirante Riveros (*ex*-Broke) Almirante Uribe (*ex*-Faulknor) Almirante Williams (*ex*-Botha)	White	1914	320	32·6	11	3	1700 to 1740	30,000	31·5	2–4·7-in., 2–4-in., 1 6-pr.	4	160	486
Capitan Orella	Laird	1896	210	21·6	5·4	2	300	6,000	30·17	1-12 pr. Q.F. 5-6 pr.	2	65	90
Capitan Muñoz Gamero	Laird	1896	210	21·6	5·4	2	300	6,000	30·42	1-12 pr. Q.F. 5–6 pr.	2	65	90
Teniente Serrano	Laird	1896	210	21·6	5·4	2	300	6,000	30·35	1–12 pr. Q.F. 5-6 pr.	2	65	90
Guardia-Marina Riquelme	Laird	1896	210	21·6	5·4	2	300	6,000	30·09	1-12 pr. Q.F. 5-6 pr.	2	65	90
Capitan Merino Jarpa Capitan O'Brien	Laird	1901	210	21·6	5·4	2	350	6,000	30	Do.	2	65	90
Captain Thompson	Armstrong	1902	..	..	..	2	480	5,600	28	6–6 pr.	2	83	90

Six submarines (Holland type) built for the British Government in 1915 were ceded to the Chilian Navy in 1917. They are numbered H 1 to H 6; 450-520 tons, 960-620 H.P., 13-11 knots, length 150 feet, 1 gun, 4 T.T.

Denmark.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
FIRST CLASS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Havkatten, Sælen	Royal Dockyard, Copenhagen	1919	126·3	13·9	8·4	2	108·5	2,000	24·6	2 6-pr. A.A.	2	22	15
Nordkaperen		1918											
Makrelen		1918											
Narhvalen		1917											
Havhesten, Söhunden		1917											
Sölöven, Stören		1916											
Springeren		1916											
Ormen		1907	124·6	14·3	8·5	1	105	2,100	26	2 1-pr.	3	21	11
Sværdfisken		1913	148·2	16·9	7·5	2	190	3,480	26·2	1 6-pr.	4	30	28
Delfinen, Hvalrossen		1913											
Söulven	Burmeister, Copenhagen	1911	181·7	18	9·7	2	275	5,000	27·5	2 12-pr.	5	33	55
Flyvefisken		1911											
Söridderen	Yarrow & Co.	1911											
Spaekhuggeren	Royal Dock., Copenhagen	1911	184·8	19·1	7·1	2	300	5,000	27·5	2 12-pr.	5	34	49
Vindhunden													
Tumleren	Schichau												

SUBMARINES—Bellona, Flora, Rota, 301–369 tons, 1 2·2-in. A.A., 4 T.T. Galathea, Neptun, Triton, Ran, Ægir, 185-235 tons, 13·5 9·8 kts., 1 2·2-in. A.A., 3 T.T. Nymfen, Najaden, Havfruen, Havmanden, Thetis, Anden 2 April, 167–204 tons, 13·5 8 kts., 2 M., 2 T.T. Two building.

France.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
FLOTILLA LEADER—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Amiral Sénès, *ex* S. 113	Germany ..	1918	360	36	15·5	2	2,380	44,000	36·9	4 5·5-in., 4 M.	4 dbl.	180	..
DESTROYERS—													
Bouclier	Normand ..	1911	237·0	24·9	9·4	3	790	13,000	35·33	2-25-pr. 4-9pr.	4	62	160
Casque	Havre (F.&C.)	1910	246·4	25	10·0	3	820	14,400	34·90	2 25pr., 4-9pr.	4	62	160
Cavalier	Normand ..	1910	222·0	21·8	10·5	3	527	8,600	31·19	4–9 prs.	2	62	150
Cimeterre	Bordeaux ..	1911	253·4	28·7	10·0	2	894	13,500	31·15	2-25pr., 4-9pr	4	62	160
Glaive..	Rochefort ..	1908	197·4	22·4	11·8	2	358	6,800	27·90	1-9pr. 6-3prs.	2	62	75
Lansquenet	Bordeaux ..	1909	216·0	20·8	10·0	3	542	8,129	28·8	6–9 prs.	3	62	150
Mameluck	Nantes ..	1909	197·2	22·8	10·0	2	407	7,750	30·5	6–9 prs.	3	62	150
Massue	Toulon ..	1908	197·4	21·7	11·4	2	350	7,128	28·4	1-9pr. 6-3prs.	2	62	75
Poignard	Rochefort ..	1909	189	22	11	2	358	6,800	28	1-9pr. 6-3prs.	2	62	75
Spahi	Havre.. ..	1908	207	21·7	10	2	455	9,000	29·4	6–9 prs.	3	62	120
Com. Bory, Francis Garnier, Com. Rivière, Capt. Mehl, Dehorter (5) ..	Normand, &c.	1912	253·6	25·4	10·0	3	780	14,100	31	2 3·9-in., 4 9 prs.	4	81	120
Bisson .. .. Protet, Magon, Comm. Lucas, Mangini (4) ..	Toulon, etc.	1912 & 1913	272·4	26	10·0	3	800	15,000	31	2 3·9-in., 4 9 prs.	2 dbl.	81	120
Enseigne Henry, Aspirant Herbert (2)	Rochefort ..	1911 & 1912	221	21·6	10·3	2	475	7,500	28·5	6–9 prs.	3	62	50
Ens. Roux, M. P. Lestin, Ens. Gabolde (3)	Rochefort & Normand	1915–1920	271	26·9	10·0	2	880	20,000	31	2 3·9-in., 4 9 prs.	3 dbl.	81	..
Buino, *ex* V. 130	Germany ..	1917	..	..	..	2	1,150	25,500	..	3 4·7 in., 2 M., 24 mines.	6	..	..
Rageot de la Touche, *ex* H. 146	Germany ..	1917	..	..	..	2	1110	23,800	33·3	3 4·7 in., 4 M., 40 mines.	6	..	..
Delage, *ex* H. 147	Germany ..												
Deligny, *ex* S. 139	Germany ..	1917	..	..	..	2	990	24,000	33·7	3 4·7 in., 4 M.	6	..	..
Chastang, *ex* S. 133	Germany ..												
Vesco, *ex* S. 134	Germany ..												
Mazaret, *ex* S. 135	Germany ..												
P. Durand, *ex* V. 79 ..	Germany ..	1915	..	..	..	2	1,170	23,000	..	3 4·1 in., 4 M., 24 mines.	6	..	..
Matelot Leblanc, *ex* Dukla	Fiume ..	1916	..	..	..	2	787	17,000	..	2 3·9 in., 6 smaller.	4	..	..
TORPILLEURS D'ESCADRE—													
Téméraire, Intrépide, Opiniâtre, Aventurier	Nantes ..	1911	270	..	..	..	950	18,000	..	4 3·9 in.	4	..	..
Annamite, Algérien, Arabe, Bambara, Hova, Kabyle, Marocain, Sakalave, Sénégalais, Somali, Tonkinois, Touareg ..	Japan	1917	272	24	7·10	..	685	10,000	29	1 4·7 in., 4–12 prs.	2 dbl.	..	..

Destroyers Bourrasque, Ciclone, Mistral, Orage, Ouragan, Simoum, Siroco, Tempête, Tramontane, Trombe, Typhon, Tornade, building, 1378 tons, 30,000 H.P., 39·5 knots, 4 4-in., 2 3-in., 4 T.T. Six flotilla leaders, 2,362 tons, and 12 destroyers, 1378 tons, are building.

France—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.
			Feet.	Feet.	Feet.		Tons.		Knots.			
SUBMARINES—												
Brumaire, Frimaire ..	Cherbourg ..	1907 to 1912	170·8	18·0	10·3	2	398	700	9½–12¼	..	7	24
Euler, Newton Arago, Curie, Le Verrier	Cherbourg .. Rochefort .. Toulon ..	1909 1912	160	16·4	13·6	2	398	340	7½–12¼	..	7	24
Clorinde, Cornélie, Amphitrite, Astrée, Artémis, Aréthuse, Atalante, Amaranthe, Andromaque	Rochefort ..	1913 1916	174	16·9	10·9	2	410	1,300	15·8	..	8	20
Néréide	Cherbourg ..	1913	243	19·8	14·4	2	787–1000	4,800	10–20	..	8	40
Bellone, Hermione, Gorgone	Rochefort .. Toulon ..	1914 & 1915	198·9	17·7	11·9	2	520	1,800	17	1–3 pr. ..	8	29
Daphne..	Cherbourg ..	1915	223	18·0	12·0	2	649–900	1800– 1600	15·1	1-75mm., 1 M.	10	..
Joessel, Fulton	Cherbourg ..	1917	243	20·0	13·4	2	915–1200	2900– 1650	16·8	2-14 pr. ..	8	..
Laplace	Rochefort ..	1917	247	21·0	13·0	2	840	..	16·5	2–14 pr. ..	8	..
Lagrange	Toulon ..	1917										
Romazzotti	Toulon ..	1918										
Amazone, Antigone ..	Schneider ..	1918	184·6	17·0	10·6	2	665-467	2,000	17·5	1-2 pr., 1 M.	6	..
O'Bryue, L. Dupetit-Thouars, Henry Fournier,	Chalons ..	1919 & 1920	172	15·6	9·6	..	335-502	1020– 460	8·14	1–3 pr. ..	4	..
Dupuy de Lôme, Sané	Chalons ..	1916	..	..	..	..	854-1291	4000– 1640	..	2–14 pr. ..	8	..
Paul Chailley	Havre	1920	246	..	..	..	866–1171	1800– 1400	13·5– 8·5	1-12 pr., 2 M. 24 mines	4	..
Maurice Callot	Bordeaux ..	1920	246	..	..	..	861–1211	2900– 1600	17–10	1-12 pr., 2 M. 27 mines	4	..
Roland Morillot (*ex*-U.B. 26)	Germany ..	1916	118·6	15	12	2	260–318	284– 280	8·5-6	1-3 pr., 1 M.	2	..

Ten other German submarinse surrendered have been embodied in the French flotilla and have received the following names: Jean Roulier, Pierre Marast, Halbronn, René Audry, Léon Mignot, Jean Autric, Victor Reveille, Jean Corre, Carissan and Trinité Schillémans. All were built in 1917-1918, and are large boats of great range (7000–10,000 miles), with four or six torpedo tubes, and one or more 4-in. guns. (Halbronn, 2000-3000 tons, 2 5·9-in.; René Audry, 1 5·9-in., 4 T.T., 42 mines). The V. Reveille is a mine-layer (36 mines).

Twelve submarines are in hand.

Greece.

Name or Number.	Where Built.	Launched.	Dimensions. Length.	Dimensions. Beam.	Dimensions. Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Coal Capacity.
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—													
Thyella .. .. .. Sphendoni .. .. Lonchi	Yarrow ..	1906	220	20·6	6·0	2	400	6000	31·79 31·84 32·53	2 12, 4 6-pr.	2	70	80
Smyrua (*ex* Austrian Ulau)	Trieste	1907	220	20	6·6	2	400	6000	27	4 11-pr., 2 11-pr., A.A.	2	86	90
Nike.. . .. .. Aspis .. .. .. Velos	Stettin (Vulcan)	1906	220	20·6	7·2	2	350	..	30	2 12, 4 6-pr.	2	58	80
Aetos, Leon, Panthir, Jerax ..	Birkenhead	1911	285	29·9	9·6	..	980	19,750	32	4 4-in.	4	110	225
SUBMARINES—													
Delphin, Xiphias ..	Chalon sur Saône ..	1911–12	164	..	..	..	300– 460	..	14·9	..	5	..	..

The two submarines are out of the service, but the submarine depôt ship Splakteria is retained.

Six 125-ton torpedo-boats built by the Vulcan Co. at Stettin: Arethusa, Doris, Aigli, Dafni, Alkyonis, Thetis, 25 knots.

The surrendered Austrian torpedo-boats: Pergamos, 92 F, 94 F, Proussa, 99 M and 100 M, 250 tons, have been added to the Greek Navy for police dnties.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
FLOTILLA LEADERS *—													
Alessandro Poerio .. Gulielmo Pepe ..	Genoa (Ansaldo)	1914	279	32·65	9·3	2	1012	20,000	32	6 4-in., 4 2-pr., A.A.	2 dbl.	100	400
Cesare Rossarol, *ex*-German B97 ..	Hamburg	1917	321	30·9	9·9	2	1354	40,200	37·5	4 4-in., 24 mines	6	..	...
DESTROYERS—													
Alpino .. .. .. Corazziere .. .. Pontiere .. .. .. Carabiniere .. .. Fuciliere	Genoa (Ansaldo)	1909 1910	211·6	20·0	7·6	2	385	6,000	30	4 14-pdr.	3	55	82
Impavido.. .. .. Indomito .. .. .. Insidioso .. .. .. Irriquieto..	Naples (Pattison)	1912 & 1913	246	24·6	7·6	2	650	15,000	35·2	5 4-in., 2 2-pr., A.A.	2	..	100
Ardito .. .. .. Ardente	Orlando (Leghorn)	1912 & 1913	246	24·6	7·6	2	650	15,000	35·5	5 4-in., 2 2-pr., A.A	2	..	..
Ascaro	Ansaldo ..	1912	211·5	20·0	6·6	2	380	6,000	29	2 14-pr. 4 6-pr.	3	..	80
Enrico Cosenz .. Antonio Mosto .. Giuseppe Sirtori .. Francesco Stocco .. Giovanni Acerbi .. Vincenzo Orsini .. Giacinto Carini ..	Naples (Pattison)	1913 & 1914	238	24	8·9	2	770	18,000	33	6 4-in., 2 2-pr., 2 M. Carry also 10 mines	2 dbl.	100	170
Rosolino Pilo .. .. Giuseppe Abba .. Simone Schiaffino .. G. Dezza .. .. .. Giuseppe Missori .. Ippolito Nievo.. ..	Genoa (Odero)												
Giuseppe La Masa.. Angelo Bassini .. Nicola Fabrizii .. Giacomo Medici .. Fratelli Cairoli .. Giuseppe la Farina	Genoa (Odero)	1917 & 1918	238	24	9·0	2	800	18,000	33	4 4-in., 2 14-pr., 2 M. Carry also 10 mines	2 dbl.	10)	150
Gen. A. Cantore .. Gen. A. Chinotto .. Gen. A. Papa .. Gen. A. Cascino .. Gen. M. Prestinari Gen. C. Montanari		1921 1922											
Audace	Yarrow ..	1918	275	27·6	8·3	2	955	21,500	36	1 4-in. 6 3-in.	2 dbl.	111	252
Ardimentoso, *ex*-S. 63	Schichau ..	1915	274	27·3	8 6	2	908	23,000	31·5	3 4·1-in.	6	..	305
Solferino, Palestro S.Martino, Curtatone Confienza, Castelfidardo, Calatafimi, Monzambano ..	Leghorn (Orlando)	1921 1922	270 262·5	26·3	8·6	2	927	27,000	32	4 4-in., 2 12 pr., A.A.	6	..	..
Cortellazzo .. .. Fasana .. .. .. Grado .. .. .. Monfalcone .. .. Muggia .. .. .. Pola .. .. Zenzon	Danubius *ex*-Austrian	1912 1916	275	25·5	7	2	850	17,600	32·5 33	2 3·9-in. 4 3-in. 2 3-in., A.A.	3 dbl. 20in.	..	95
FIRST CLASS—													
Calipso .. .. .. Climene	Naples (Pattison)	1909 1909											
P.N., 1–4, 6–12, 33–38, 40–45, 64, 65, 69–71	Pattison ..	1912 & 1913	139	13·9	5·5	2	130	2,500	27	1 6-pr.	2	..	15
A.S., 25–30, 52–57 ..	Ansaldo ..												
O.S., 13–16, 18–24, 27, 28, 30, 47–51	Odero	1914											
O.L., 58-63 .. .. O.L.T., 74, 75 ..	Orlando .. Orlando ..	1916 1920	139	13·5	5·5	2	157	3,000	27-29	2 14-pr. A. A.	2	..	25
C.P., 76–79	Palermo ..	Bldg.	154	..	..	..	..	3,000	..	2 14-pr., A.A.	1 dbl.	..	..

Destroyer No. 4 building (Pattison, Naples), 1150 tons, length 285·5, beam 28·3, draught 10, 28,000 H.P.; three 4·7-in., 3 M., six 18-in., T.T. Three others contemplated.

*** For five scouts built and three building, intended also to act as flotilla leaders; see the Italian light-cruiser list.**

Italy—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
SUBMARINES—													
L. Galvani, E. Torricelli, P. Micca	Spezia	1917 1919	207·5 218·0	20·3 19·0	15·6 15·6	.. ..	830/1000 740/920	2600/1230	15-9·5 17-9·2	2 14-pr. A.A.	6	..	..
L. Mocenigo L. Marcello A. Emo	Venice												
A. Barbarigo A. Provana S. Veniero G. Nani	Spezia, F.I.A.T.												
X 2, 3	Ansaldo	1917	139·9	18	11	..	400/460	660/320	9·2–6·3	1 12-pr. 18 mines	2	..	..
H 1 to 4, 6 to 8	Vickers	1917	15·0	16	12	..	360/440	480/320	12–8·9	1 12-pr.	4	22	..
F 1, 2, 5, 6, 7, 9, 10, 12–21	F.I.A.T. Odero Orlando	1913 1917 1918	148	14	10	..	260/380	700/320	13–8·5	1 12-pr. A.A.	2	..	12
Argonauta	Ansaldo	1915	148·3	13·9	9-1	..	250/300	700/250	13-9	1 12-pr. A.A.	2	..	..
N 1 to N 6	..	1917 1918	150	14	9-9	..	270/350	700/320	13·6-8	1 12-pr. A.A.	2	..	..

Four submarines, 600 tons submerged, are in the new programme.

Japan.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
DESTROYERS:			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
FIRST CLASS—													
Umikaze, Yamakase	Maidzuru	1909–11	310·0	..	9·0	3	1150	20,500	33	2 4·7-in., 5 12-pr.	4	123	..
Amatsukaze Tokitsukaze Isokaze Hamakaze	Kure and Nagasaki	1916	310·0	28·0	9·3	3	1227	27,000	34	4 4·7-in., 2 M.	6	..	..
Tanikase, Minekase Kawakase Sawakase	Maidzuru Yokosuka Mitsubishi	1916–19	320	29·3	9·5	2	1300 1345	38,000	34	4 4·7-in., 2 M.	6	..	..
Okikase, Shimakase, Nadakase, Yakase, Hakase	Maidzuru												
Suzukase, Soyokase, Tsumujikase, Makase, Okase, Namikase, Numakase, Nokase, Tashikase, Shiokase, Hokase, Yukase, Akikase Nos. 11, 13, 15	Mitsubishi, Kawasaki, Maidzuru	1920–2 and Bldg.	320	29	9·5	2	1400	38,500	34	4 5·5-in. 2 M.	6	..	..

Japan—*continued.*

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
DESTROYERS—*contd.*													
SECOND CLASS—													
Isonami, Uranami Ayanami	Maidzuru	1907–9	220·3	20·6	6·0	2	374	6,000	29	6 12-prs.	2	70	90
Sakura, Tashibana	Kure	1912	288·0	..	7·3	3	600	9,500	30	1 4·7-in. 4 12-pr.	4	..	..
Kaba Kaede Kashiwa Katsura Kiri Kusunoki Matsu Sakaki Sugi Ume	Yokosuka Maidzuru Nagasaki Kobe Uraga Sasebo and Osaka	1915	260·0	24·0	7·9	2	665	9,500	30	1 4·7 in. 4 12-pr.		..	..
Momo, Yanagi Kashi, Hinoki	Sasebo Maidzuru	1916–17	275·0	25·0	7·9	2	835	16,000	31·5	3 4·7 in., 2 M.	6	..	..
Nara Kuwa, Tsubaki Maki, Keyaki Yenoki	Yokosuka Kure Sasebo Maidzuru	1917–18	275·0	26·0	8·0	2	835 900	21,000	31·5	3 4·7 in., 2 or 3 M., A.A.	4or 6	..	..
Momi, Take Nashi, Kaki Kaya, Kure Nire, Tsuga	Maidzuru, etc.												
Yurakaze	Yarrow	1915	275·3	27·6	7·11	2	955	22,000	28	1 4·7-in., 4 12 pr.	4	..	..
Kiku, Aoi, Hagi, Susuki, Fuji, Tsuta, Hishi, Hasu, Ashi, Warabi, Sumire, Tade, Yomogi, Karukaya, Kikyo, Yuri, Ayame, Kaido, Kakitsubata, Tsutsuji, Ajisai, Nos. 18 and 20	Kobe, Uraga, Ishikawa-jima, Fujinagata, Kawasaki	1920–1922 and bldg.	..	..	..	2	900	22,000	33	3 4·7 in. 3 M., A.A.	4 G	..	..

To be completed in 1923, six second-class destroyers, 900 tons, 33 knots, 4 or 6 T.T.: Tade, Shion, Nadeshiko, Botan, Omodaka, Basho. About twenty others of the same class are planned, as also twenty-four of the powerful "Kase" class, the later boats reported to displace 1900 tons and to mount 4·7-in. guns, with 3, 4, or 6 T.T. Seven are said officially (August, 1923) to be in hand.

Name or Number.	Where Built.	Launched.	Length.	Beam.	Draught.	Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
SUBMARINES—													
Nos. 8, 9	Vickers	1908	..	..	..	..	285/315	600/180	..	..	2	..	..
,, 10, 11, 12	,,	1911	..	..	..	..	290/320	600/300	..	..	2	..	..
,, 13	,,	1911	..	..	..	..	300/330	1000/300	..	..	2	..	..
,, 14–24	,,	1918–20	..	..	..	..	740/1110	2600/1200	..	1 12-pr. 1 3-pr.	6	..	..
,, 25–30	,,	1919–20	..	..	..	..	900/1082	2600/1200	..	12-pr. A.A. 1·3-pr.	6	..	..
,, 31–33	,,	1921	..	..	..	..	700/1072	2600/1200	..	1 12-pr. A.A. 1 3-pr.	5	..	..
,, 34–45	,,	1920–21	..	..	.	..	740/1100	2600/1200	..	12-pr. A.A. 1 3-pr.	6	..	..
,, 46, 47	Kawasaki	1921–22	..	..	..	..	900/1082	2400/1600	..	1 12-pr. 1 3-pr.	4 21-in.	..	..

About forty-six additional submarines are projected and building. The surface displacement is increased to about 1,250 tons or more, and the range extended to 11,000 miles. It is stated that the surface speed is 17 knots, that some of the boats will carry a 5·5-in. gun, and have from four to six T.T., and that some are fitted as mine-layers. In the later classes of submarine cruisers, of which the most recent is reported to be No. 79, the power and range are increased. The surface displacement is said to be 2,000 tons, and the boats to carry two guns, and to be provided with 16 torpedoes and mining gear. When No. 77 sank off Awaji Island on August 21, 1923, it transpired that the complement was 95, as compared with 65 in the British M. class boats.

Netherlands.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Wolf, Fret (1909) .. Bulhond, Jakhals (1910) Hermelijn, Lynx, Panter, Vos (1911)	Flushing ..	1910–1913	230	20·6	9	2	480	7,500	30	4 2·9-in. semi-aut. 4 M.	2	84	80
FIRST CLASS—													
Zeeslang, Krokodil, Draak, Hydra, Minotaurus, Python, Scylla, Sphinx ..	Flushing ..	1905	152·6	15·3	7·9	1	130	1,900	27	2 3-prs.	2	25	36
G 13–15–16	Scheldt .. Fijenoord ..	1914	165	17·3	9·5	..	188	2,000	26	2 12-pr.	3dbl	..	..
Z 2–4..	Amsterdam	1916–1917	201	20·4	6	2	322	5,500	27	2 12-pr., 2 M.	2 1dbl	42	53
Z 5–8..	Scheldt .. Fijenoord ..	1915	192	30	5, 6	2	310 312	5,500 5,700	27 27	2 12-pr., 2 M.	2 1dbl	42	81

The named destroyers and first-class boats belong to the forces of the Dutch Indies. The other torpedo-boats are in Holland.

SUBMARINE boats.—O 2 and 3, 132–150 tons, 11·8 knots, 2 tubes. O 4 and 5, 380 tons, 151 ft. 6 in. long, 16 knots (surface), 11 knots (submerged) speed. O 6 and 7, built in Holland, 178–234 tons. British interned submarine bought by the Dutch Government and taken over as O 8, June, 1917; O 9–11 building. M 1 submarine mine-layer. K submarines for the East Indies: K 1, 320–380 tons, 3 tubes; K 2–7, 560–700 tons, 1 2·9-in.; 1 M., 6 tubes, 16·10 knots; K 8–10, 570–700 tons, 1 3·4-in., 1 M., 6 tubes: Nos. 9 and 10 not completed.

Norway.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
DESTROYERS—			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Draug, Troll, Garm	Horten ..	1908–13	226	25·0	..	2	540	7,500	27·0	6 12-pdrs.	3	71	95
FIRST CLASS—													
Snoegg, Stegg, Trygg	Horten ..	1919–1920	175	18	5¼	2	220	3,500	25	2 12-pdr.	4	31	29
SECOND CLASS—													
Hval, Delfin	Elbing ..	1896–1900	130·0	15·0	6·9	1	84	1,100	24·5	2 1·4-in.Q.F.	2	19	17
Storm, Brand, Trods	Horten ..		128·0	15·0	..	1	84	1,100	23	2 1·4-in.Q.F.	2	19	17
Laks, Sild, Sael, Skrei	Horten ..	1901	128·0	15·0	6·9	1	84	1,100	23	2 1·4-in.	2	19	17
Kjek, Hvas, Dristig, Kvik, Djerv, Blink, Lyn, Hauk, Falk, Glimt	Fredrikstad Horten ..	1898 1903	111·5	14·5	6·3	1	65	650	19	2 1·4-in.	2	..	..
Skarv, Teist, Lom, Jo, Grib	Horten ..	1906–7	134·5	14·9	..	1	100	1,700	25·0	2 3-pr.	2-3	18	16
Ravn, Orn	Horten ..	1903	119	14·9	6·4	1	73	1,035	22·5	2 1·4-in.	2	16	15
Kjeld..	Horten ..	1912	135	14·9	6·4	1	100	1,800	25	1 12-pr.	3	19	16
SUBMARINES—													
A 1, 2, 3, 4	Germania Kiel	1909 to 1913	131·6	14·9	9·6	2	220 255	440 250	12 9	..	3	17	..
B 1, 2	Horten ..	1923	..	..	..	..	413–545	..	15–11	..	..	..	..
B 3, 4	Horten ..	Bldg.											
MINING VESSELS:—													
Froeya	Horten ..	1917–1918	250	27	8¼	2	755	..	22	4 4-in.	2	80	95
Glommen, Laugen..	Christiania..		138	28	6¼	2	335	350	9·5	2 12-pdr.	..	39	21

Spain.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Destroyers—													
Terror, Audaz.. ..	Clydebank ..	1896 1897	220 229	22	9·9	2	300	6,000 7,950	29	4 2½-pr. 2 6-pr. 2 1-pr.	2	74	100 93
Osado, Proserpina ..	Clydebank ..	1897	229	22	9·9	2	457	7,500	30	2 14-pr. 2 6-pr. 2 1-pr.	2	74	90
Bustamente	Cartagena ..	1913–1915	220	22	5·6	..	364	6,250	28	5 6-pr.	2	..	..
Villaamil	Cartagena ..												
Cadarso	Cartagena ..												
Torpedo Boats—													
22 boats	Cartagena ..	1913– 1922	164	16·5	4·9	3	177	3,750	26	3 3-pr.	3	..	..

Three destroyers are in hand at Cartagena: 1140 tons, 34 knots, turbines, 33,000 h.p., three 4-in., two 12-prs., 4 tubes. Three others are in the programme.

In September, 1917, three submarines (A 1, 2 and 3), built in Italy, were delivered (260-383 tons, 700-500 h.p., 13–8·5 knots, two tubes), and six others (two completed and in service), 610–740 tons, 17–10·5 knots, two 12-pr. 6 T.T., will give Spain a flotilla of ten boats, the tenth being the Peral (500–685 tons, 17–10·5 knots, one 12-pr., 4 tubes).

Sweden.

Name or Number.	Where Built.	Launched.	Dimensions.			Number of Screws.	Displacement.	Indicated Horse-Power.	Maximum Trial Speed.	Armament.	Torpedo Tubes.	Complement.	Fuel Capacity.
			Length.	Beam.	Draught.								
			Feet.	Feet.	Feet.		Tons.		Knots.				Tons.
Destroyers—													
Mode	Yarrow ..	1902	220·3	20·6	8·9	2	480	6,800	32·4	1 12-pr. 5 6-prs.	2	55	95
Magne	Thornycroft	1905	216·9	20·8	8·2	2	480	7,200	30·0	2 12-prs. 4 6-prs.	2 dbl.	63	90
Wale..	Malmo ..	1906											
Ragnar	Malmo ..	1909											
Sigurd	Gothenburg	1909											
Vidar	Malmo ..	1909											
Hugin	Gothenburg	1909											
Munin	Malmo ..	1910											
Wrangel	Gothenborg	1918	230	22	8·2	2	500	..	34·0	2 12-prs., 6 4-prs.	2 dbl.	..	..
Wachtmeister.. ..													
Torpedo-Boats—													
Plejad, Castor, Pollux	Normand & Carlskrona	1905–1909	125	14·4	6·6	1	106	1,900	26	2 1·5-in. Q.F.	2	18	20
Vega .. .. Vesta	Carlskrona..	1909	128	14·4	8·6	1	105	1,900	25	2 6-prs.	2	18	20
Spica, Astrea, Iris, Thetis	Bergsund and Gothenburg	1909	128	17·5	8·6	1	120	1,900	25	2 6-prs.	2	18	20
Altair .. .. .. Antares .. .. .. Argo .. .. .. Arcturus	Stockholm ..	1908	128	17·5	8·6	..	110	2,000	25	2 6-prs.	2	18	20
Perseus, Polaris .. Regulus, Rigel ..	Bergsund .. Stockholm ..	1910–1915	128	14·4	8·6	1	115	2,000	25	2 6-prs.	2	18	20

Also ten small torpedo-boats, 60 tons, built 1907–1908.

Submarines: Bävern, Valrossen, Illern, Uttern, Sälen, Valen, 460 tons (1920–21), Hajen, 107–127 tons (1920), Gädden, Braxen, Laxen, Aborren, 200 tons (1915–16), Delfinen, 250–270 tons, one M., 2 T.T. (1915), Tumlaren, Svaerdfisken (1914), 250–370 tons. Nos. 2–4 (1904–10). Details of the Swedish submarines are given under reserve. The facts are confidential. The new programme includes additional submarines.

United States

No destroyers are, at the present time, building for the United States Navy. The oldest class, 21 in number, date from 1910–12, and will probably soon be removed from the list. They are 21-knot boats of 742 tons, and 12,000 H.P., five 13-prs. and three double 18-in T.T. Their names are:

Paulding, Drayton, Roe, Terry, Perkins, Sterett, McCall, Burrows, Warrington, Mayrant, Monaghan, Trippe, Walke, Ammen, Patterson, Fanning, Jarvis, Henley, Beale, Jouett, Jenkins.

The next class (1913–16), 19 in number, of 1020–1150 tons and 16,000–18,000 H.P., 29–30 knots, mount four 4-in. guns, and have four double 18-in. or 21-in. T.T. They are:

Cassin, Cummings, Downes, Duncan, Aylwin, Parker, Benham, Balch, O'Brien, Nicholson, Winslow, McDougal, Cushing, Ericsson, Tucker, Conyngham, Porter, Wadsworth, Wainwright.

A very extensive class follows (1916–20), comprising 121 vessels. The displacement approximates 1,185 tons in the later boats, the H.P. increases to 27,000, and the speed, from the Ringgold onward, reaches 35 knots. The armament of this class is four 4-in., and two 14-pr. A.A., with four triple 21-in. T.T. They are:

Sampson, Rowan, Davis, Allen, Wilkes, Shaw, Caldwell, Craven, Gwin, Conner, Stockton, Manley, Wickes, Philip, Evans, Little, Kimberley, Sigourney, Gregory, Stringham, Dyer, Colhoun, Stevens, McKee, Robinson, Ringgold, McKean, Harding,† Gridley, Fairfax, Taylor, Bell, Stribling,* Murray,* Israel,* Luce,* Maury,* Lansdale,* Mahan,* Schley, Champlin, Mugford,† Chew, Hazelwood, Williams, Crane, Hart,* Ingraham,* Ludlow,* Rathburne, Talbot, Waters, Dent, Dorsey, Lea, Lamberton, Radford, Montgomery, Breese, Gamble, Ramsay, Tattnall, Badger, Twiggs, Babbitt, Jacob Jones,* Buchanan, Aaron Ward, Hale, Crowninshield, Boggs, Kilty, Kennison, Ward,* Claxton, Hamilton, Tarbell, Yarnall, Upshur, Greer, Elliot, Roper, Breckinridge, Barney, Blakeley, Biddle, Du Pont, Bernadou, Ellis, Cole, J. Fred Talbot, Dickerson, Leary, Schenck, Herbert, Palmer, Thatcher, Walker, Crosby, Meredith, Bush, Cowell, Maddox, Foote, Kalk, Burns,* Anthony,* Sproston,* Rizal,* Mackenzie, Renshaw, O'Bannon, Hogan, Howard, Stansbury, Hopewell, Thomas, Haraden, Abbot, Bagley, Clemson.

The final class (1919–22) is of the same type, and comprises 155 vessels. The displacement is 1,215 tons and the H.P. 27,000. All these vessels have oil fuel and geared turbines, many of them electric drive, and the designed speed is 35 knots. The armament is the same as in the preceding list, except that there is but one 14-pr. A.A. There are a few exceptions, the Long having eight 4-in., the Kane, Fox, Gilmer, Brooks, and Hatfield four 5-in., and the Tillman two 13-pr. A.A. Seven vessels of this class, Delphy, S. P. Lee, Chauncey, Fuller, Woodbury, Nicholas, and Young, were involved in the disaster of September 9, 1923, when, steaming at 20 knots in fog and heavy tide, they ran on the rocks near Santa Barbara. The list of the class is as follows:

Dahlgren, Golsborough, Semmes, Satterlee, Mason, Abel P. Upshur, Hunt, Welborn C. Wood, George E. Badger, Branch, Herndon, Dallas, Chandler, Southard, Hovey, Long, Broome, Alden, Smith Thompson, Barker, Tracy, Borie, John D. Edwards, Whipple, Parrott, Stewart, Hatfield, Brooks, Gilmer, Fox, Kane, Humphreys, McFarland, James K. Paulding, Overton, Sturtevant, Childs, Sands, Reuben James, Belknap, McCook, Rodgers, Ingram-Osmond, Bancroft, Welles, Aulick, Turner, Gillis, Delphy, McDermut, Laub, McLanahan, Edwards, Greene, Ballard, Shubrick, Bailey, Thornton, Morris, Tingey, Swasey, Meade, Sinclair, McCawley, Moody, Henshaw, Meyer, Doyen, Sharkey, Toucey, Breck, Isherwood, Case, Lardner, Putnam, Worden, Flusser, Dale, Reid, Chauncey, Fuller, Percival, John Francis Burnes, Farragut, Somers, Stoddert, Reno, Farquhar, Thompson, Kennedy, Paul Hamilton, William Jones, Woodbury, S. P. Lee, Nicholas, Young, Zeilin, Yarborough, La Vallette, Sloat, Wood, Shirk, Kidder, Selfridge, Marcus, Mervine, Chase, Robert Smith, Mullany, Preston, Lamson, Litchfield, Zane, Wasmuth, Trever, Hulbert, Noa, William B. Preston, Preble, Tillman, Pillsbury, Ford, Truxton, Paul Jones, King, Williamson, Bainbridge, Goff, Barry, Hopkins, Lawrence, Coghlan, Hull, McDonogh, Fahrenholt, Sumner, Perry, Decatur, Converse, Billingsley, Osborne, Bruce, Charles Ausburne, Edsall, MacLeish, Simpson, Bulmer, McCormick, Corry, Melvin, Pope, Peary, Sicard, Pruitt.

SUBMARINES.

The earlier submarines are being eliminated from the Fleet. The D, F, and G classes have been removed, and the H, K, L, and N classes are for coast defence only. Some of the N class and the single boat of the M class are for sale. The S class is the latest, and of the 51 boats, about 20 have yet to be completed. The first of the class displaces 854–1,062 tons, with 1,200 H.P., but the later boats are 1,200–1,500 H.P. Up to No. 20 the armament is one 3-in., but in the later boats the calibre is increased to 4-in. The T.T. are four 21-in., but a few of the boats have five tubes. Twelve torpedoes are carried. The Fleet submarines are T 1, 2, 3 (1919–20), are of 1,106–1,487 tons and 4,000–1,520 H.P., and have two 13-prs. and eight 21-in. tubes, and carry 16 torpedoes. Their surface speed is estimated at 21 knots. V 1, 2, 3, just completing, are larger; 2,114–2,520 tons and estimated H.P. of 7,500, and they have one 5-in. and one 3-in. A.A., with six 21-in. T.T.

The flotillas are as follows:—

H 2 to 9.	1919.	357–454 tons, 12–10½ knots	8
K 1 to 8.	1914.	392 500 tons, 24–9½ knots.	8
L 2, 3, 5–9.	1916–17.	450·548 tons, 17½–10½ knots, 4 T.T.	7
N 1 to 3.	1918–19	357–454 tons, 4 T.T. (4 torpedoes)	3

The following are the first line boats:—

O 1 to 16.	1918.	520–692 tons, 4 T.T., (8 torpedoes), 1 3-in., 14–11 knots	16
R 1 to 27.	1918–19.	569–680 tons, 13½–10½ knots, 4 T.T., (8 torpedoes), 1 3-in. (coastal)	27
S 1 to 4, 6 to 51.		Approximately 900–1100 tons, 3 and 4-in. guns, 12 21-in. torpedoes carried	50

Fleet submarines:—

T 1, 2, 3 completed; V 1, 2, 3 completing. Others of these classes were in the programme, but are not building	6

The list makes a total of 125 boats, of which about 23 have yet be to completed.

* Fitted as mine-layers. † Fitted as seaplane tenders.

PLANS

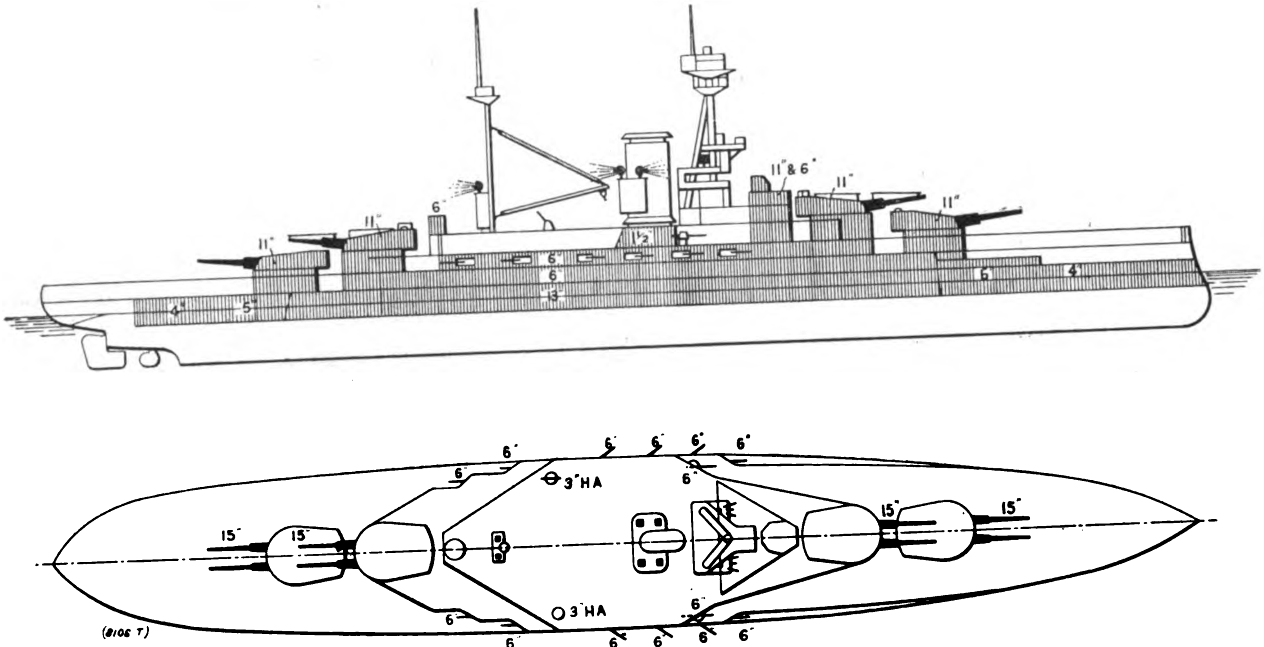
OF

BRITISH AND FOREIGN WARSHIPS.

GREAT BRITAIN.

BATTLESHIPS.

Royal Sovereign. **Royal Oak.** **Revenge.** **Resolution** **Ramillie**



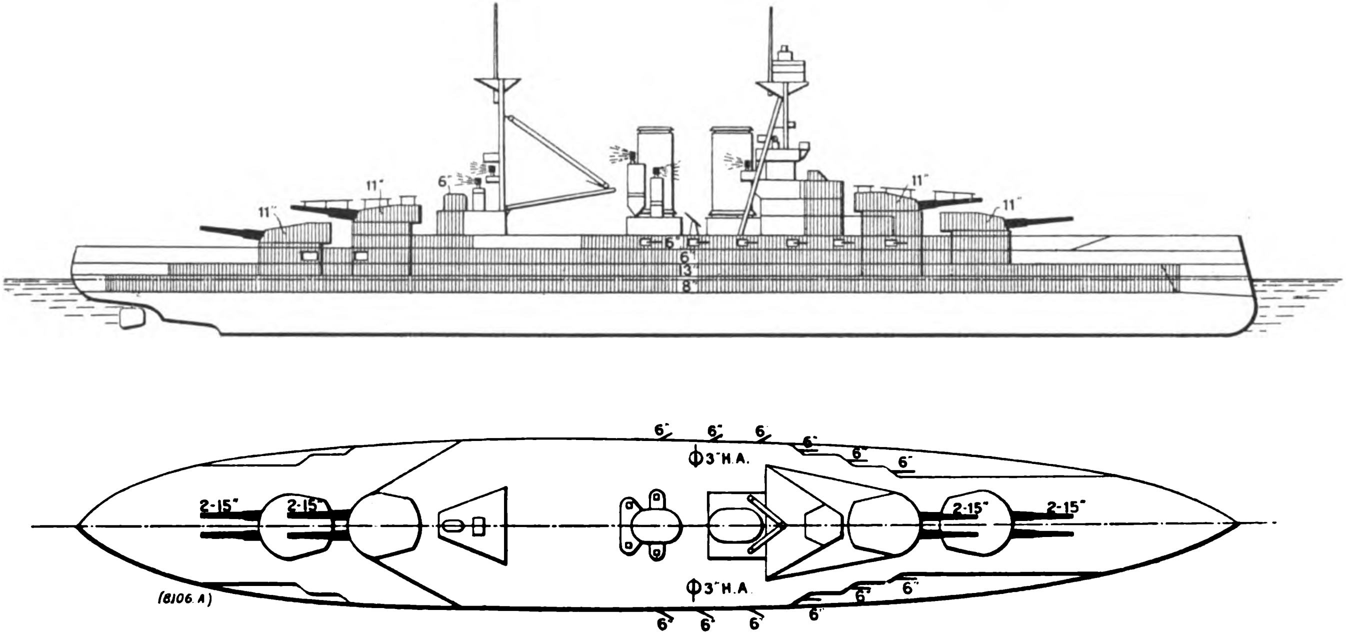
Length (extreme), 620 ft. 6 ins.* ; Length B.P., 580 ft. ; 25,750 tons ; Speed, 23 knots ; Completed, 1916–17.
Armament, 8—15 in. ; 14—6 in. ; 2—3-in. H.A. ; 4—3-pr. ; 5 M ; 10 L.

* Revenge, 624 ft. 6 in.

GREAT BRITAIN.

BATTLESHIPS.

Queen Elizabeth. Warspite. Barham. Valiant. Malaya

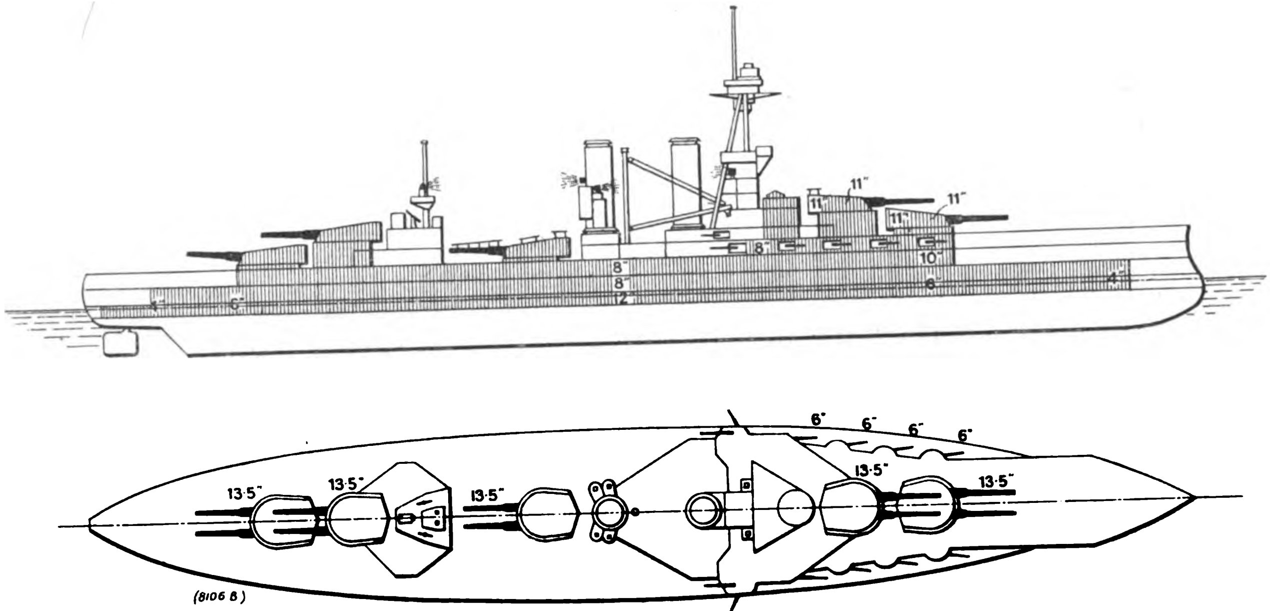


Length (extreme), 639 ft. 9 ins.*; Length B.P., 580 ft.; 27,500 tons; Speed, 25 knots; Completed, 1915-1916.
Armament, 8—15-in.; 12—6-in.; 2—3-in. H.A.; 4—3-pr.; 5 M.; 10 L.
* Barham and Warspite, 643 ft. 9 ins.

GREAT BRITAIN

BATTLESHIPS.

Iron Duke. **Marlborough.** **Benbow.** **Emperor of India.**



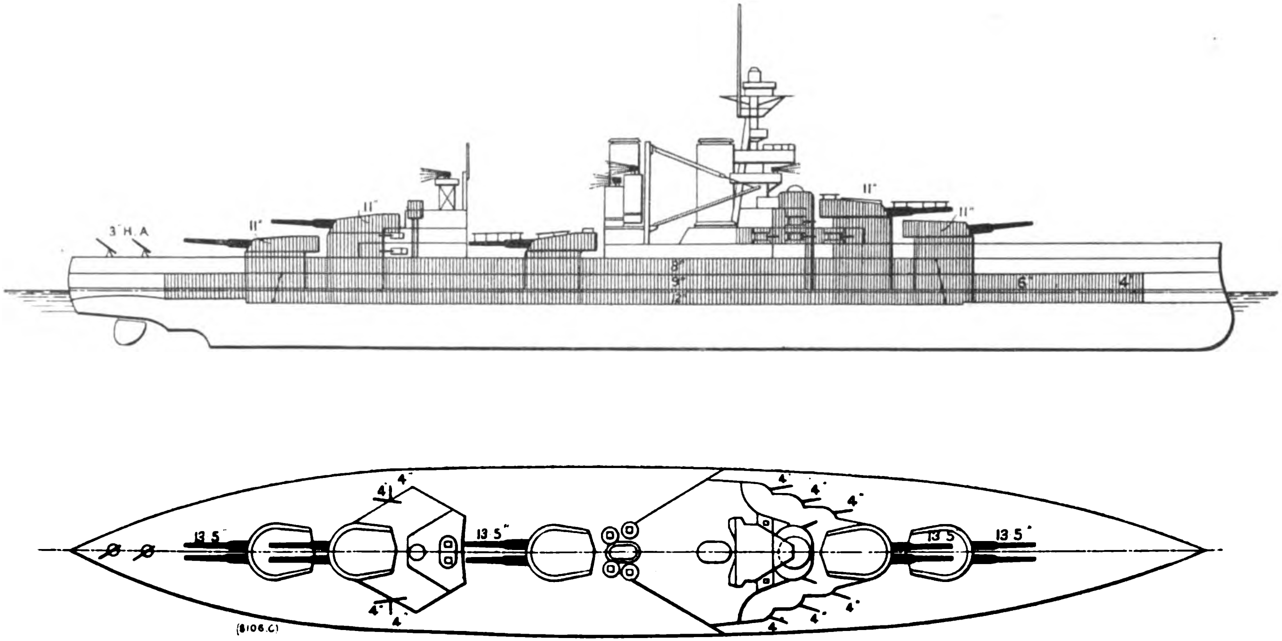
Length (extreme), 623 ft. 9 ins.*; Length B.P., 580 ft.; 25,000 tons; Speed, 21 knots; Completed, 1914.
Armament, 10—13·5-in.; 12—6-in.; 2—3-in. H.A.; 4—3-pr.; 5 M; 10 L.

* Marlborough, 623 ft.; Emperor of India, 622 ft. 9 ins.

GREAT BRITAIN.

BATTLESHIPS.

King George V. Ajax. Centurion.



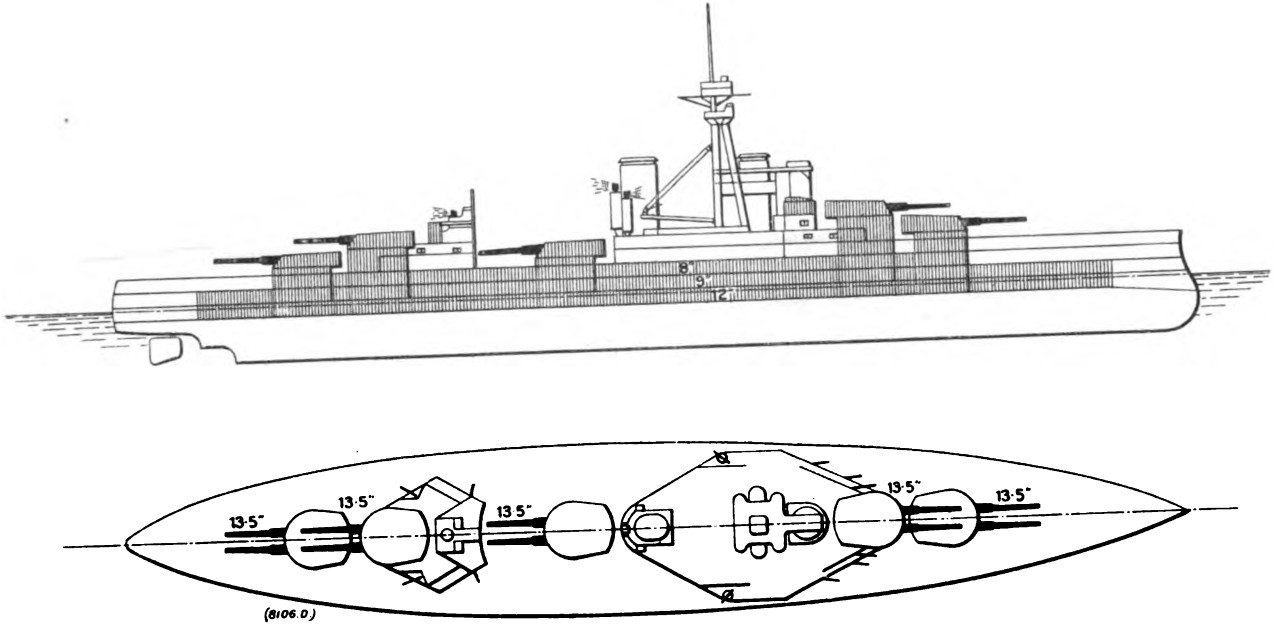
Length (extreme), 597 ft. 9 ins.* ; Length B.P., 555 ft. ; 23,000 tons ; Speed, 21 knots ; Completed, 1912-13.
Armament, 10—13·5-in. ; 12—4-in. ; 4—3-pr. ; 5 M. ; 10 L.

* King George V., 594 ft. 4 ins.

GREAT BRITAIN.

BATTLESHIP.

Thunderer (Cadets' Training Ship).

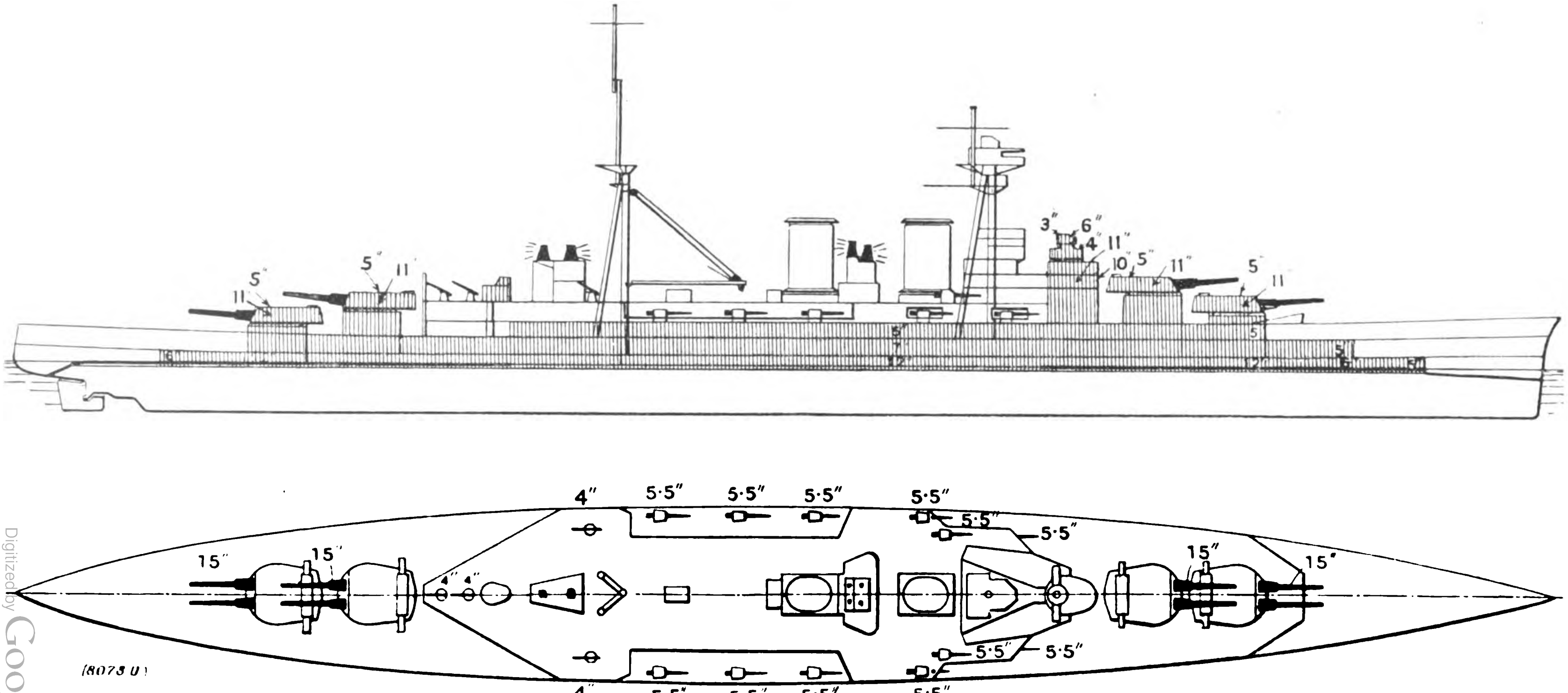


Length (extreme), 581 ft. 2 ins.; Length B.P., 545 ft.; 22,500 tons; Speed, 21 knots; Completed, 1912.
Armament, 10—13·5-in.; 8—4-in.; 1—3-in. H.A.; 4—3-pr.; 5 M.; 10 L.

GREAT BRITAIN.

BATTLE-CRUISER.

Hood.



(8075 U)

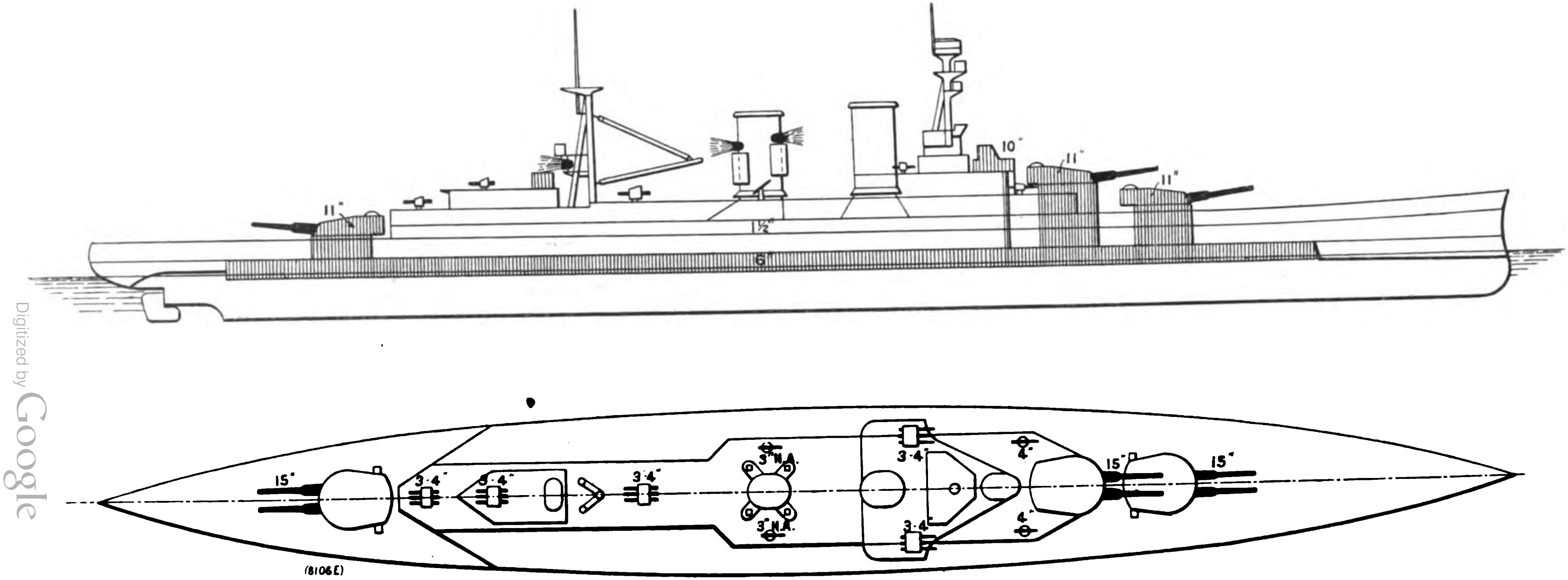
Length (extreme), 860 ft. 7 ins.; Length B.P., 810 ft.; 41,200 tons; Speed, 31* knots; Completed, 1920.
Armament, 8—15-in.; 12—5·5-in.; 4—4-in. H.A.; 4—3-pdr.

* Trials at 44,600 tons, 31·89 knots with 151,000 S.H.P.

GREAT BRITAIN.

BATTLE-CRUISERS.

Repulse. **Renown.**



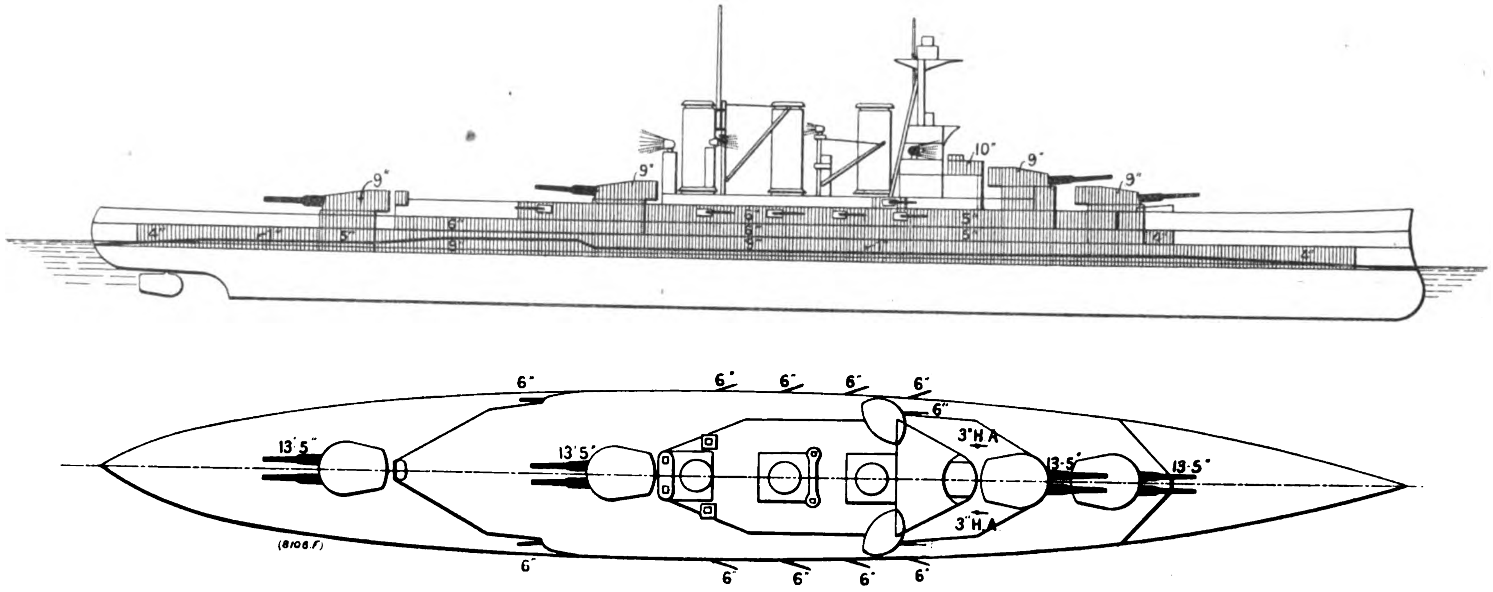
Length (extreme), 794 ft. 2 ins.; Length, B.P., 750 ft.; 26,500 tons; Speed, 31·5 knots; Completed, 1916.
Armament, 6—15-in.; 17—4-in.; 4—3-pr.; 2—3-in. H.A.; 5 M.; 10 L.

NOTE.—Repulse was re-armoured in 1920–21, the side armour amidships now being 9 in. and 6 in. Similar re-armouring of the Renown is allowed for by Chapter II., Part 3, Section (*d*) 2, of the Treaty of Washington.

GREAT BRITAIN.

BATTLE-CRUISER.

Tiger.

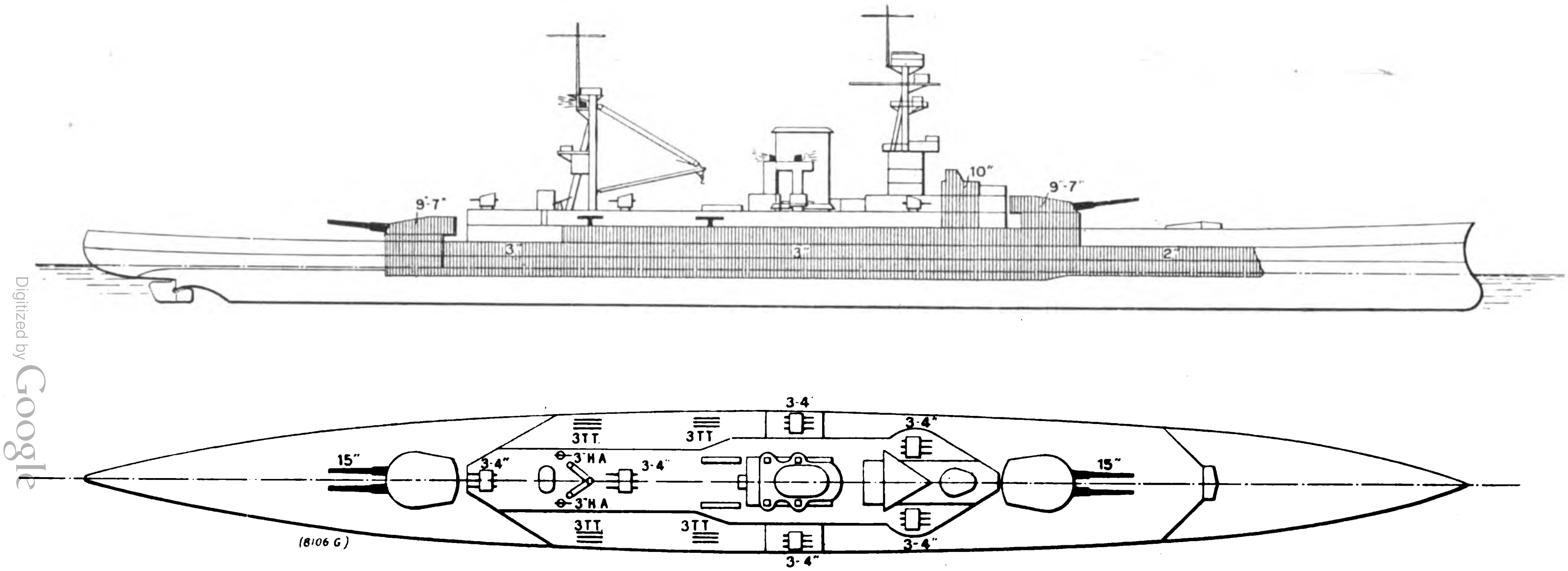


Length (extreme), 704 ft. ; Length B.P., 660 ft. ; 28,500 tons ; Speed, 30 knots ; Completed, 1914.
Armament, 8—13·5-in. ; 12—6-in. ; 4—3-pr. ; 2—3-in. H.A. ; 5 M. ; 10 L.

GREAT BRITAIN.

LARGE LIGHT CRUISERS.

Courageous. **Glorious.**

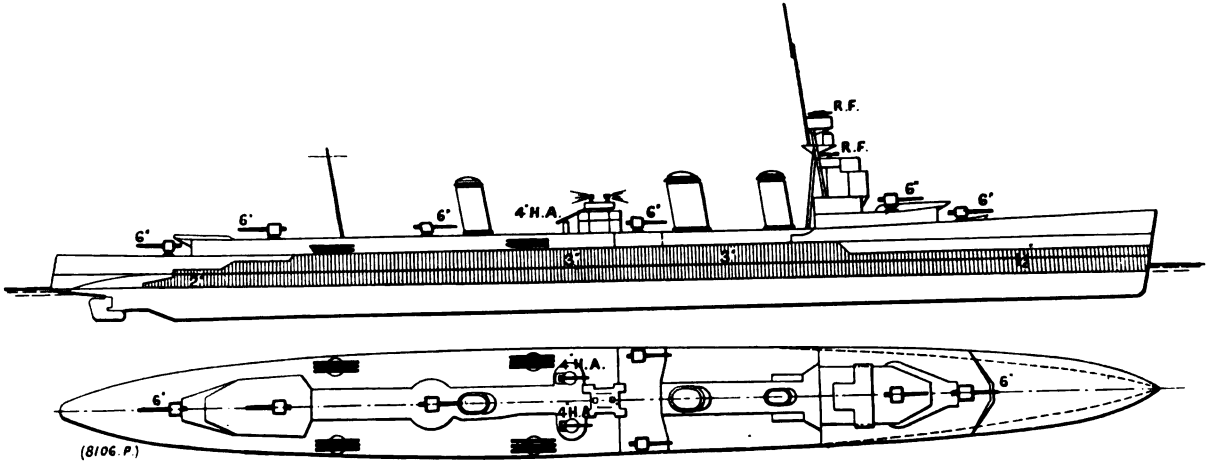


Length (extreme), 786 ft. 3 ins. ; Length B.P., 735 ft. ; 18,600 tons ; Speed, 31 knots ; Completed, 1917.
Armament, 4—15-in. ; 18—4-in. ; 2—3-in. H.A. ; 4—3-pr. ; 5 M. ; 10 L.

GREAT BRITAIN.

LIGHT CRUISERS.

Emerald. **Enterprise.**

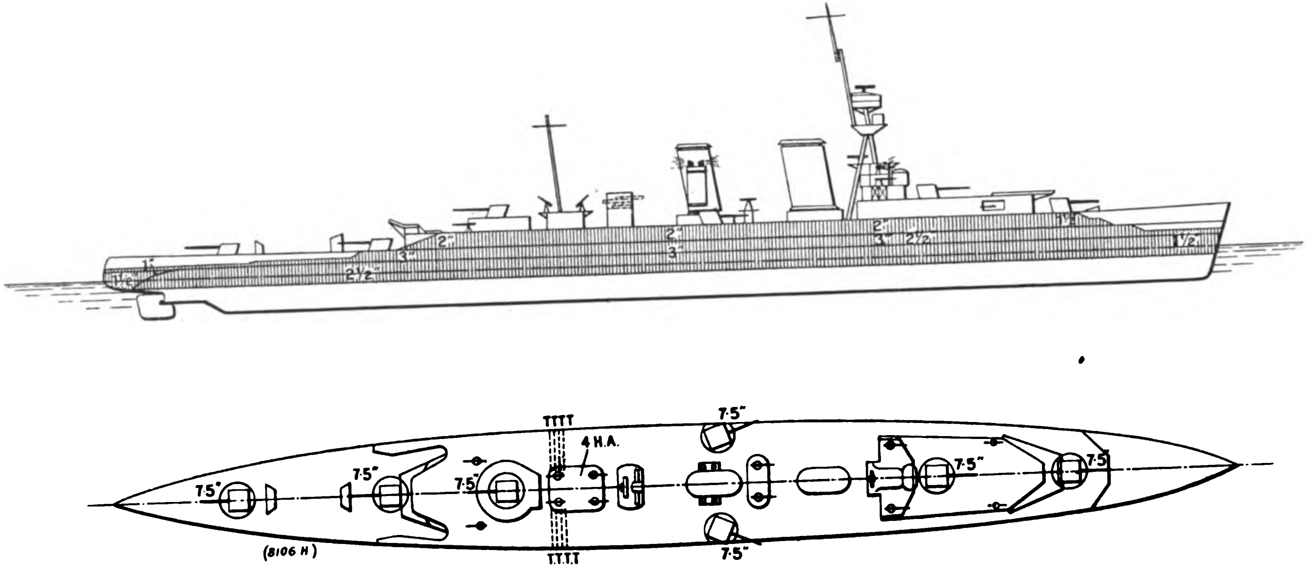


Length (extreme), 570 ft. ; Length B.P., 535 ft. ; 7,550 tons ; Speed, 33 knots.
Armament, 7—6-in. ; 2—4-in. H.A. ; 4—3-pr. ; 2—2-pr. Pom Pom. ; 1 M.

GREAT BRITAIN.

LIGHT CRUISERS.

Effingham. **Hawkins.** **Frobisher.**

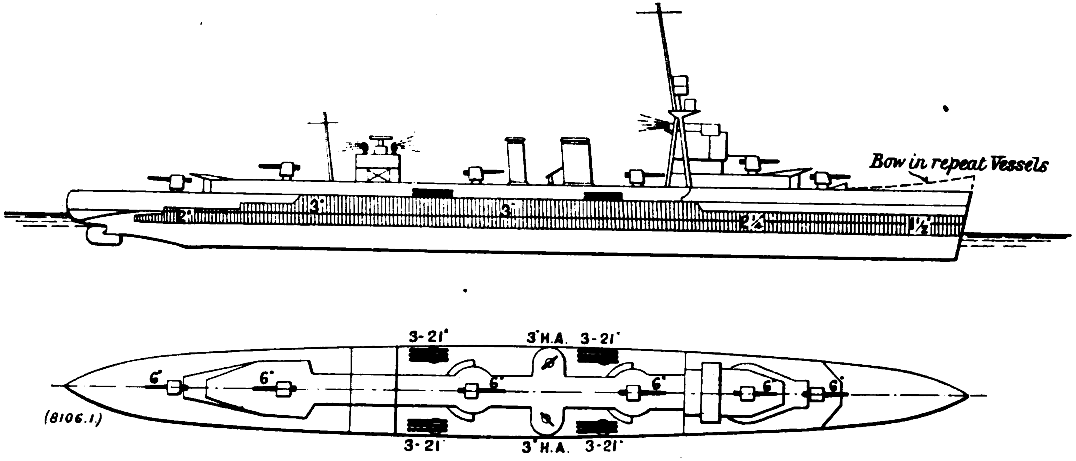


Length (extreme), 605 ft. ; Length B.P., 565 ft. ; 9,750 tons ; Speed, 30 knots.
Armament, 7—7·5-in. ; 4—3-in. H.A. ; 2—2-pr. ; 2 M. ; 8 L.

GREAT BRITAIN.

LIGHT CRUISERS. D CLASS.

Despatch.* **Diomede.*** **Danae.** **Dauntless.** **Dragon.** **Delhi.*** **Dunedin.*** **Durban.***



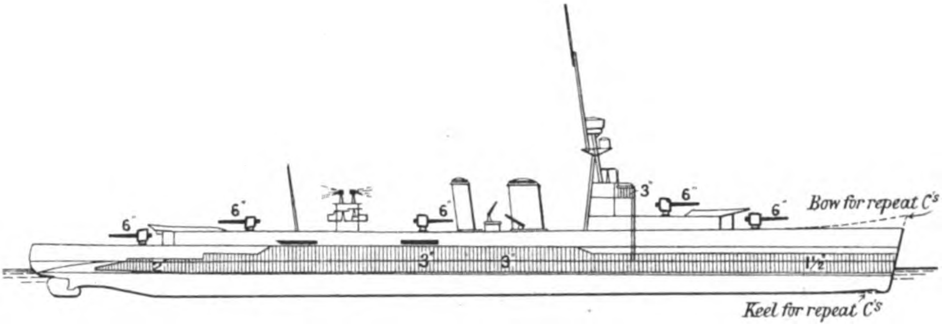
Length, 445 ft. ; 4,750 tons †; Speed, 29 knots ;
Armament, 6—6 in. ; 2—3-in. H.A.‡ ; 2 M.

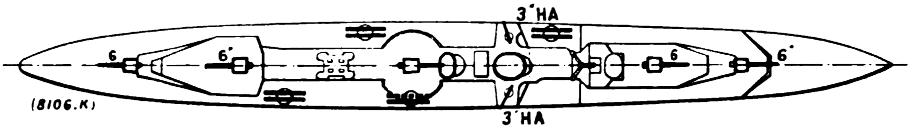
* Repeat vessels.
† Despatch and Durban are 4,765 tons.
‡ Despatch, Diomede, and Durban have 2—4-in. H.A. guns.

GREAT BRITAIN.

LIGHT CRUISERS.

Ceres.	**Curacoa.**	**Curlew.**	**Cardiff.**	**Coventry.**
***Cairo.**	**Cape Town.**	**Carlisle.**	**Colombo.**	**Calcutta.**



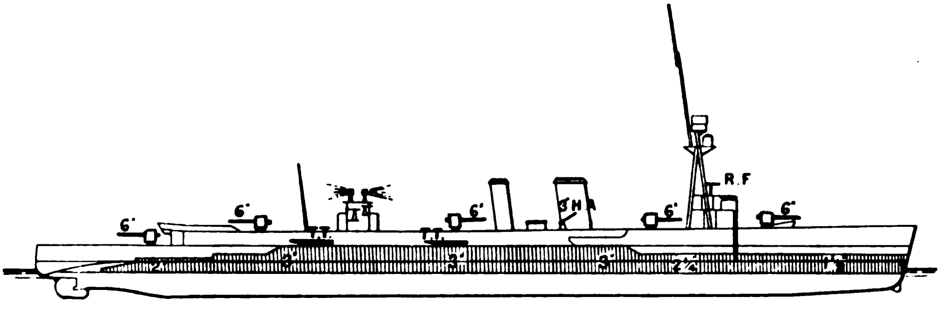


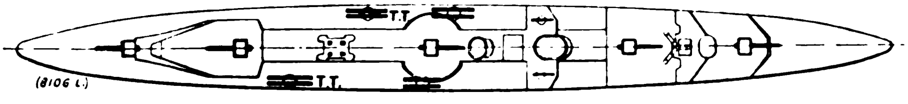
Length (extreme), 450 ft. (451 ft. 6 ins. Repeat Vessels); Length B.P., 425 ft.; 4,190 tons; Speed, 29 knots; Completed, 1917-18 (Repeat Vessels, 1918-22).
Armament, 5—6-in.; 2—3-in. H.A.; 4—3-pr.; 2—2-pr. Pom Poms; 4 above-water D.R. torpedo tubes.

* Repeat vessels.

LIGHT CRUISERS

Caledon.	**Calypso.**	**Caradoc.**
***Centaur.**	**Concord.**	





* These Plans apply to the above-named ships, but there are differences in detail, as stated.

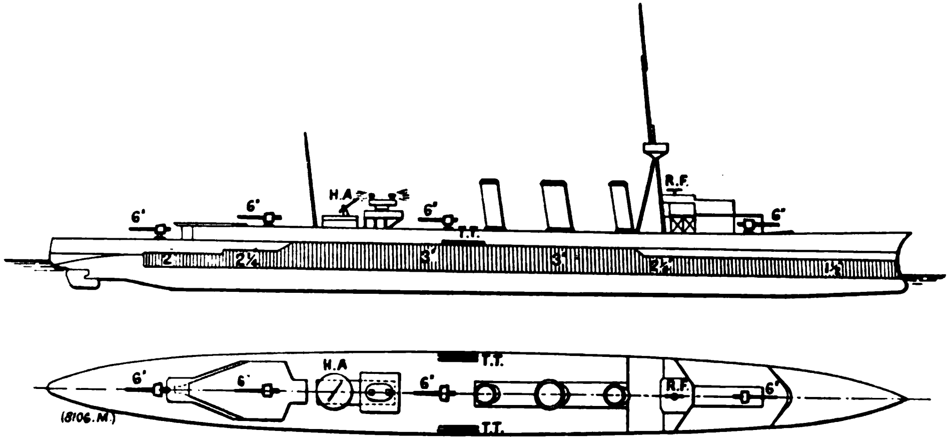
Caledon } **Calypso** } **Caradoc** } Length (extreme), 450 ft.; Length B.P., 425 ft.; 4120 tons; Speed, 29 knots; Completed, 1917.
Armament, 5—6-in.; 2—3-in. H.A.; 4—3-pr.; 2—2-pr. Pom Poms; 2 M.; 8 L.; and 4 above-water D.R. torpedo tubes.

Centaur } **Concord** } Length (extreme), 446 ft.; Length B.P., 420 ft.; 3,750 tons; Speed, 29 knots; Completed, 1916.
Armament, 5—6-in.; 2—3-in. H.A.; 2—3-pr.; 2—2-pr. Pom Poms; 2 M.; 4 L.; and 2 submerged torpedo tubes.

GREAT BRITAIN.

LIGHT CRUISERS.

*Cambrian. Conquest. Canterbury. Carysfort. Constance. Cleopatra. Castor. Comus. Champion. Calliope.



* Plans apply, except that these ships have two funnels instead of three, and there are slight variations of armament as stated below.

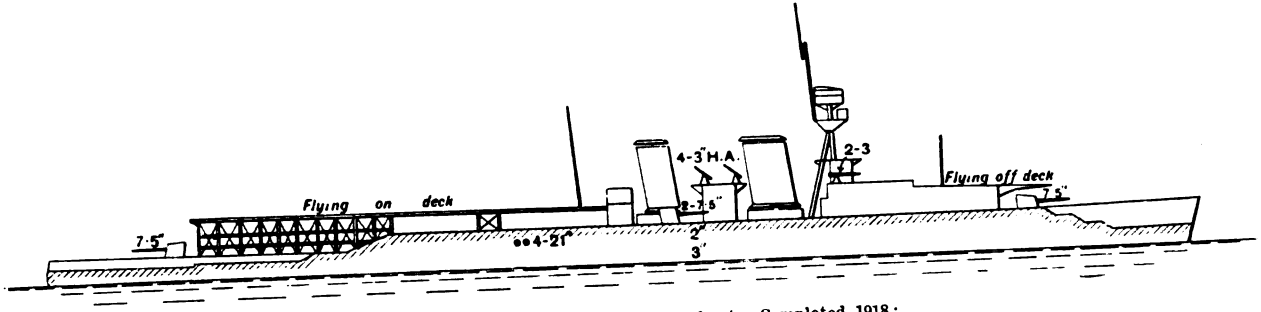
Conquest Carysfort Cleopatra Comus	Length (extreme), 446 ft.; Length B.P., 420 ft.; 3,750 tons; Speed, 29 knots; Completed, 1915. Armament, 4—6-in; 2—3-in H.A.; 2—2-pr. Pom Poms; 1 M.; 8 L.; 2 above water D.R. torpedo tubes. (Comus and Carysfort have 4—3-pr.)
Cambrian Canterbury Constance Castor	Armament, 4—6-in.; 2—3-in. H.A.; 4—3-pr.; 2—2-pr. Pom Poms; 1 M.; 8 L.; 2 submerged torpedo tubes.
Champion	Armament, 4—6-in.; 1—4-in. H.A.; 2—2-pr. Pom Poms; 1 M.; 8 L.; 2 submerged torpedo tubes.
Calliope	Armament, 4—6-in.; 2—3-in. H.A.; 4—3-pr. 2—2-pr. Pom Poms; 1 M.; 8 L.; 2 submerged torpedo tubes.

GREAT BRITAIN.

LIGHT CRUISER.

Vindictive.

Aircraft Carrier.

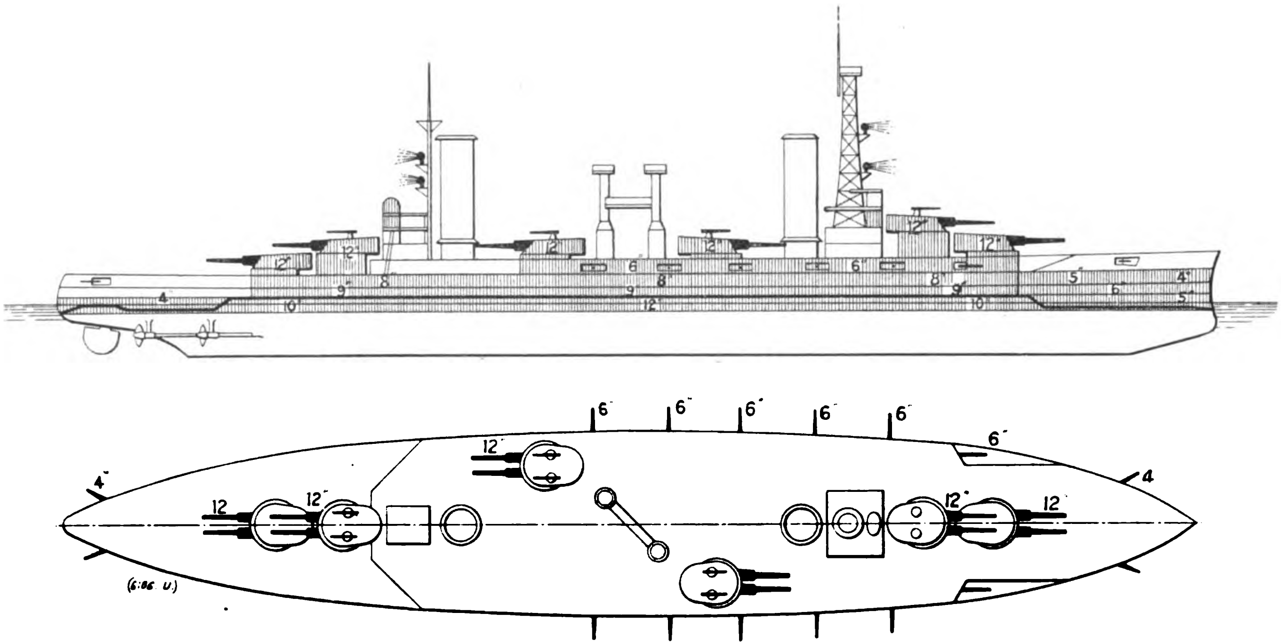


Length, 565 ft. ; 9750 tons ; Speed, 28·75 knots ; Completed, 1918 ;
Armament, 4—7·5-in. ; 4—3-in. ; 4—3-in. H.A. ; 1—12-pr. ; 13 M.

ARGENTINE.

BATTLESHIPS.

Moreno. **Rivadavia.**

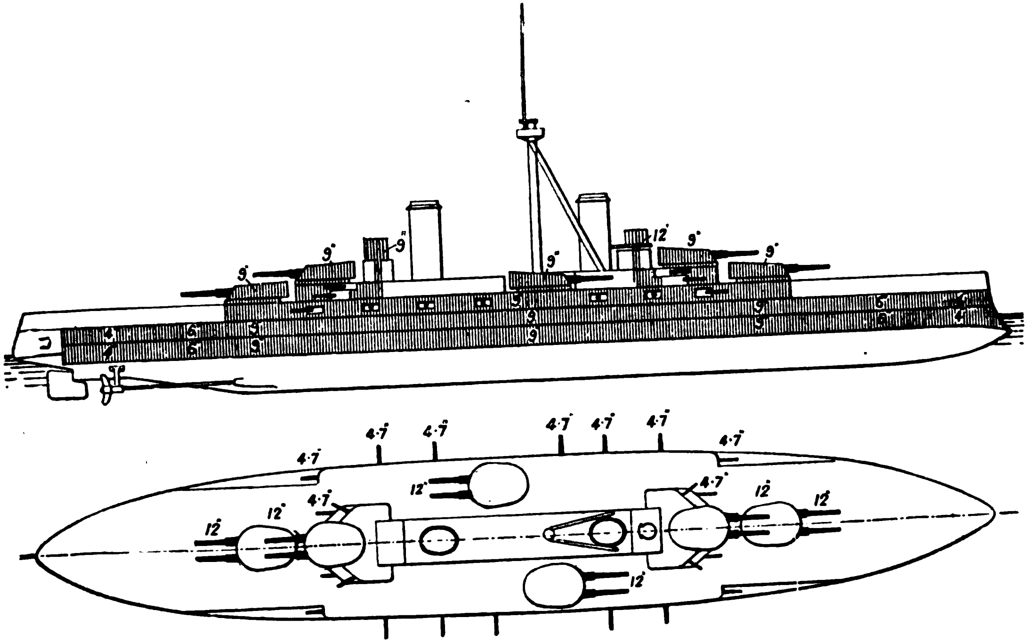


Length (extreme), 585 ft.; Length on W.L., 575 ft.; Speed, 22 knots; Completed, 1914-15.
Armament, 12—12-in.; 12—6-in.; 16—4-in.; 8 smaller.

BRAZIL.

BATTLESHIPS.

Minas Geraes. **São Paulo.**

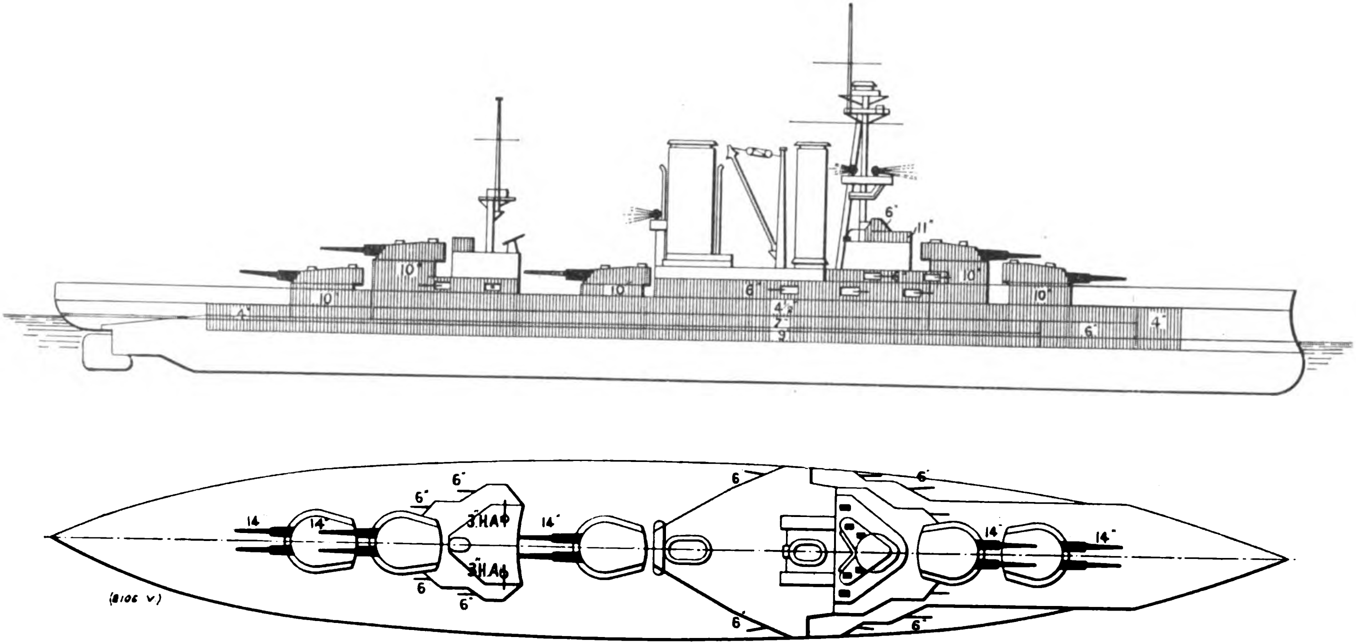


Length, 500 ft. ; 19,281 tons ; Speed, 21·5 knots ; Completed, 1909, 1910.
Armament, 12—12-in. ; 22—4·7-in. ; 8—3-pr.
Overhauled and refitted at Brooklyn Navy Yard, 1921-22, and A.A. guns installed.

CHILE.

BATTLESHIP.

Almirante Latorre (*formerly* H.M.S. Canada).

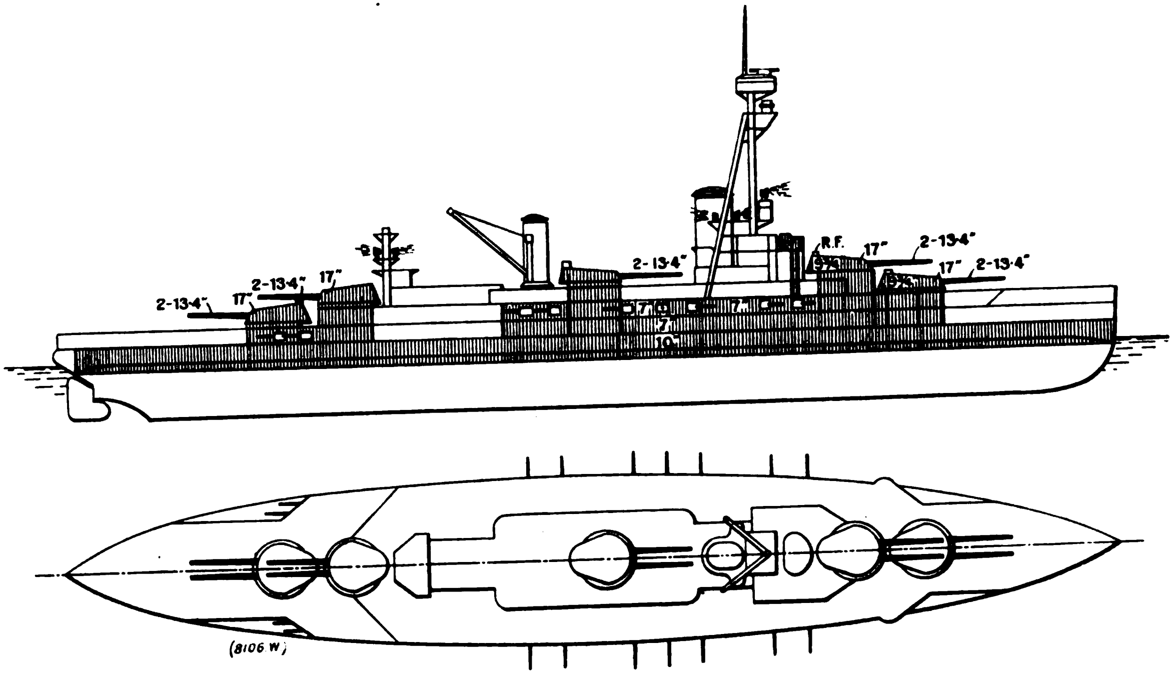


Length (extreme), 661 ft. ; Length B.P., 625 ft. ; 28,000 tons ; Speed, 23 knots ; Completed, 1915.
Armament, 10—14-in ; 14—6-in. ; 2—3-in. ; and smaller.

FRANCE.

BATTLESHIPS.

Bretagne. **Lorraine.** **Provence.**

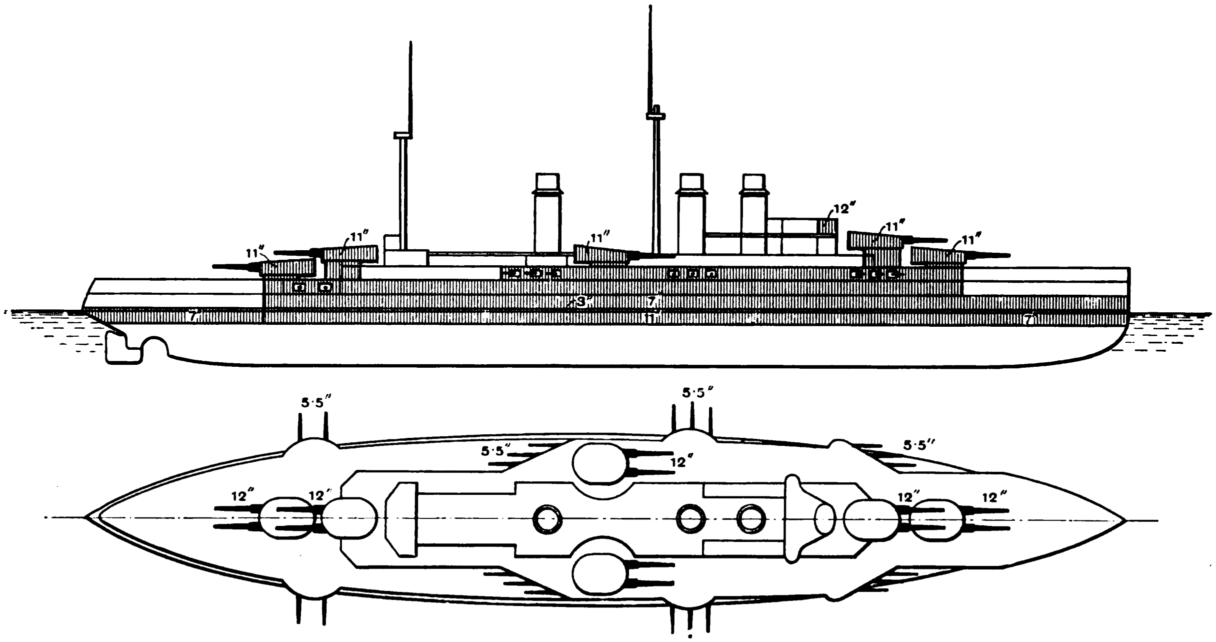


Length (extreme), 544 ft. 6 ins.; 23,177 tons; Speed, 20 knots; Completed, 1915–16; Reconstructed, 1919–20.
Armament, 10—13·4-in.; 18—5·5-in.; 2—14-pr. A.A.

FRANCE.

BATTLESHIPS.

Jean Bart. **Courbet.** **Paris.**



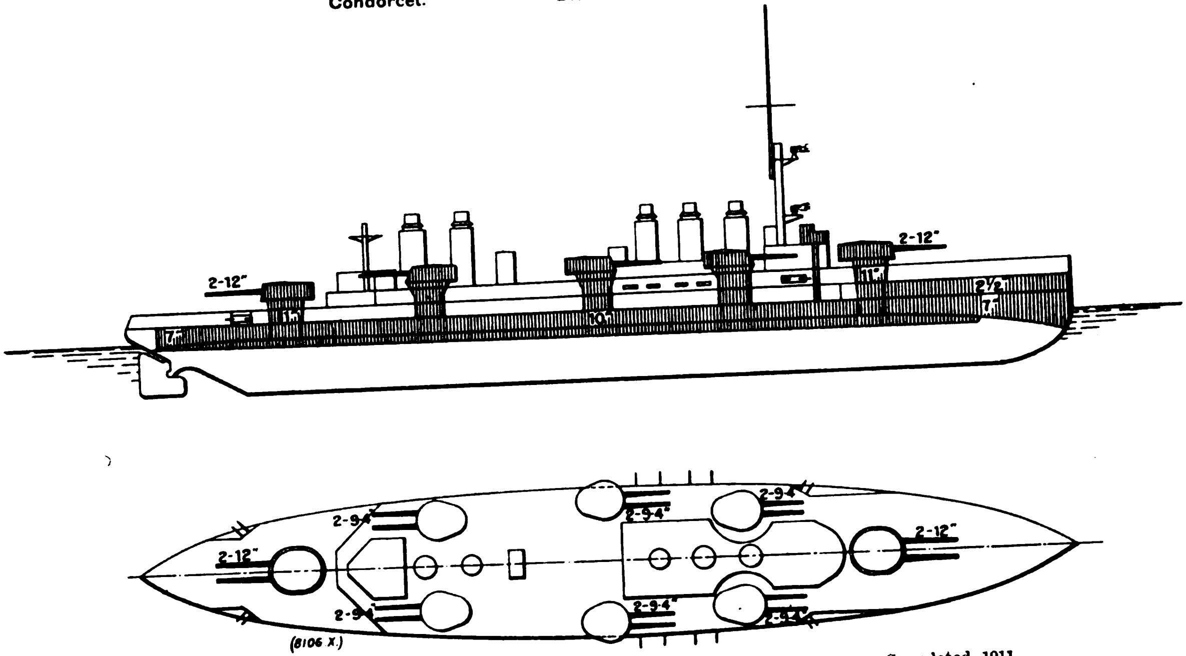
Length (extreme), 544 ft. 6 ins.; Length B.P., 541 ft. 6-ins.; 23,500 tons; Speed 20 knots; Completed, 1913-14.
Armament, 12—12-in.; 22—5·5-in.; 4—3-pr.

NOTE.—These vessels are being reconstructed, and, when completed, will resemble "Bretagne" class, page 497. The sister ship France foundered in 1922.

FRANCE.

BATTLESHIPS.

Condorcet. Diderot. Voltaire.

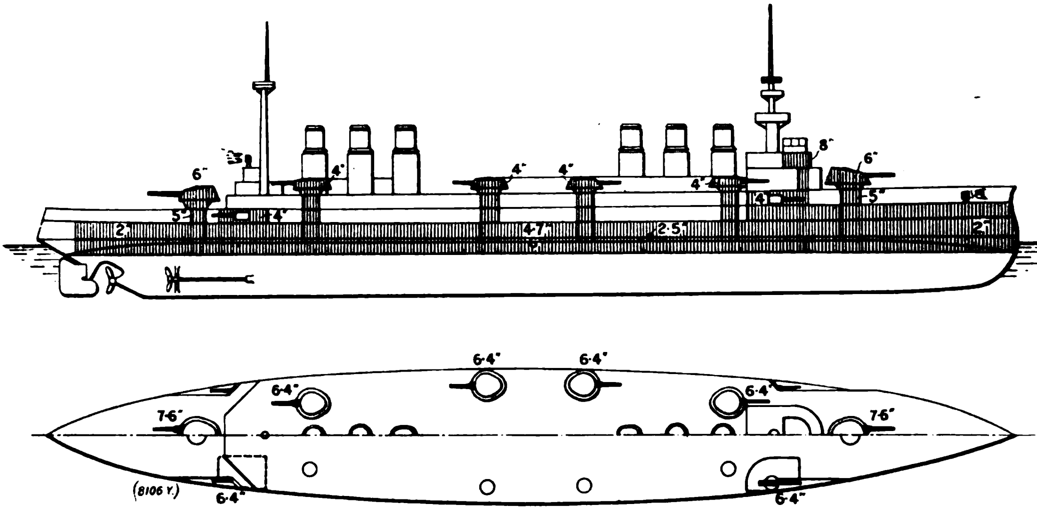


Length (extreme), 481 ft. ; Length W.L., 475 ft. 9 ins. ; Speed, 19¼ knots ; 18,600 tons ; Completed, 1911.
Armament, 4—12-in. ; 12—9·4-in. ; 12—3-in. ; 2—3-pr.

FRANCE

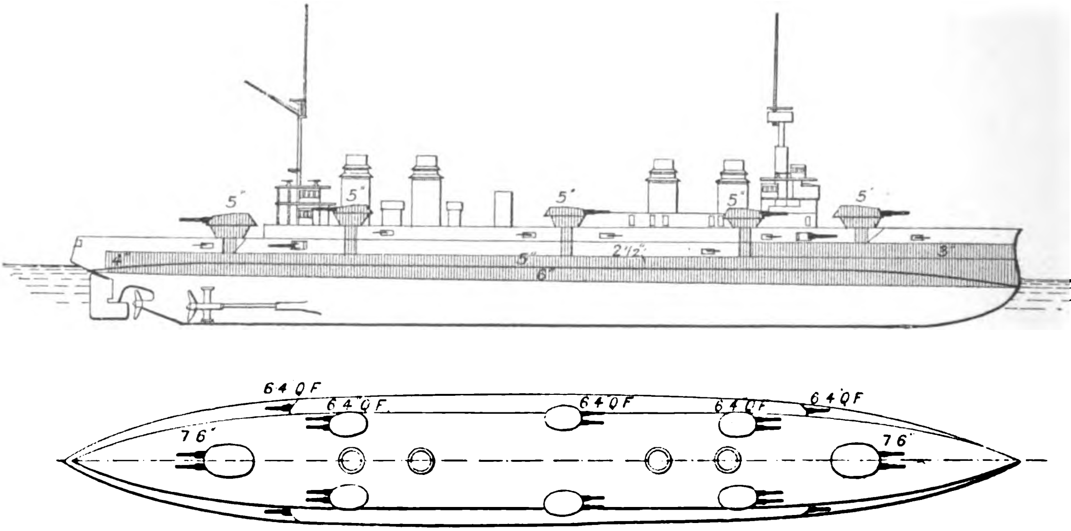
ARMOURED CRUISERS.

Ernest Renan. Jules Michelet.



Length, 515 ft and 489 ft 6 ins. ; 13,500 tons and 13,100 tons ; Speed, 23 knots and 22 knots ; Completed, 1909 and 1908 ; Armament, 4—7·6-in., 12—6·5-in. ; and smaller.

Jules Ferry. Victor Hugo

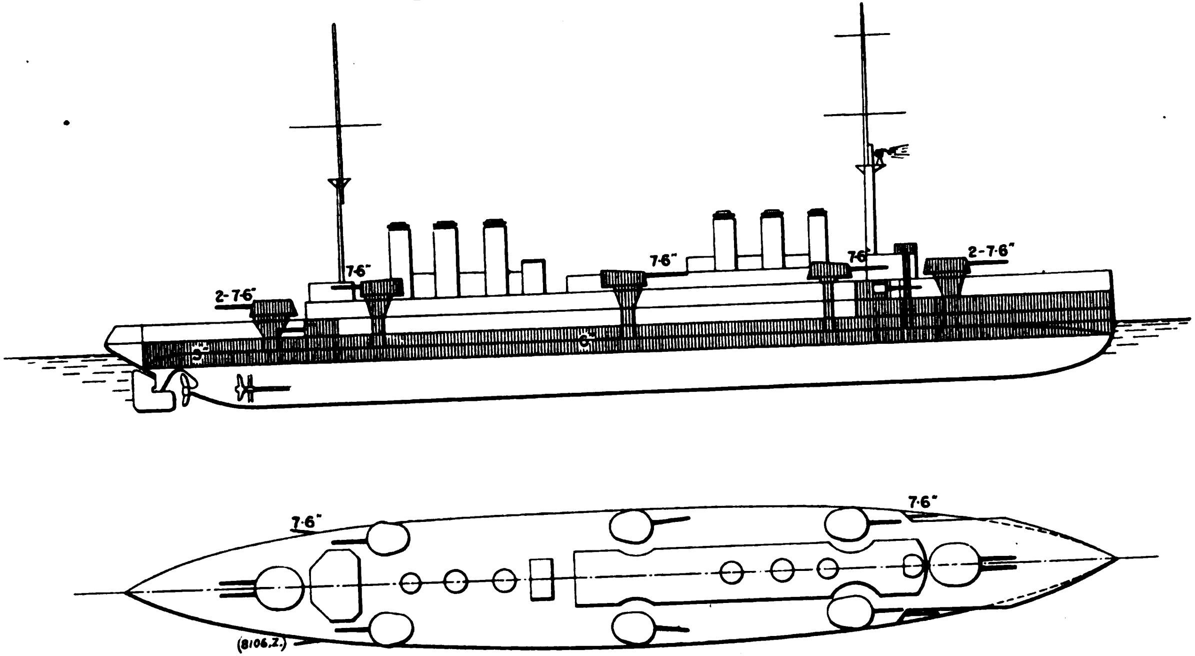


Length, 487 ft. and 480 ft. 6-ins. ; 12,351 and 13,108 tons ; Speed, 22 knots ; Completed, 1906–1907 ; Armament, 4—7·6-in., 16—6·4-in. ; 24 smaller.

FRANCE.

ARMOURED CRUISERS.

Edgar Quinet. **Waldeck Rousseau.**

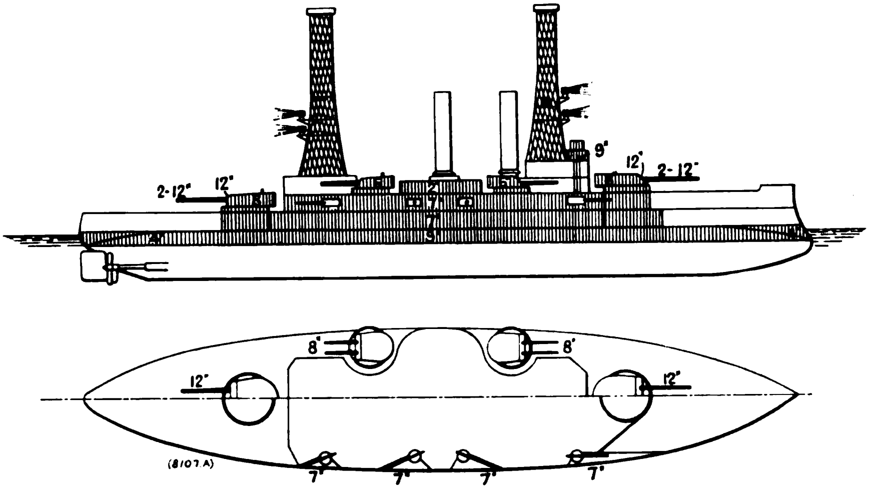


Length (extreme) 521 ft. 4 ins.; Length W.L., 515 ft.; Speed, 23 knots; 13, 990 tons; Completed, 1911.
Armament, 14—7·6-in.; 14—9-pr.; and smaller.

GREECE.

BATTLESHIPS.

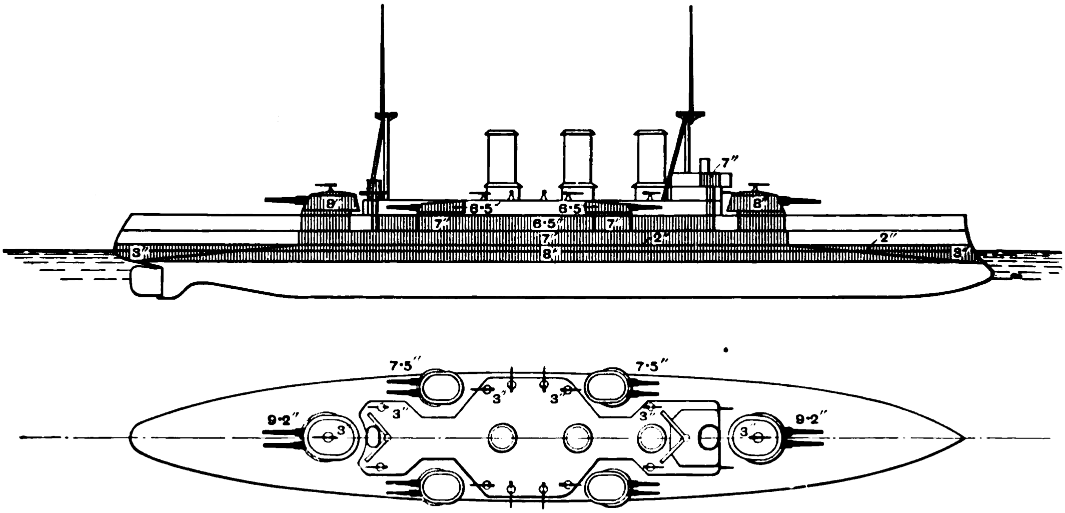
Lemnos (*ex* **Idaho**). **Kilkis** (*ex* **Mississippi**).



Length, 375 ft. ; 13,000 tons ; Speed, 17·1 knots ; Completed, 1908.
Armament, 4—12-in. ; 8—8-in. ; 8—7-in. ; 12—3-in. ; 14 smaller.

ARMOURED CRUISER.

Giorgios Averoff.

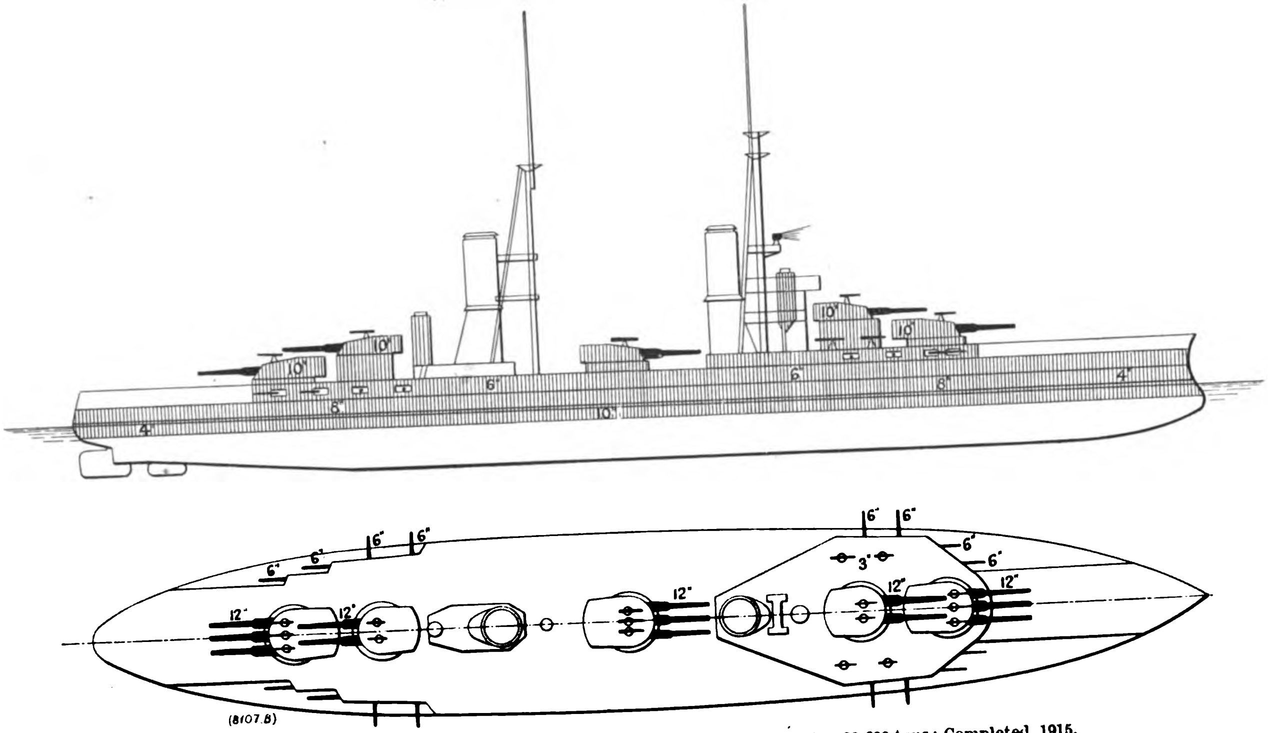


Length, 420 ft. 9 ins. ; 9,956 tons ; Speed, 24 knots ; Completed, 1911.
Armament, 4—9·2-in. ; 8—7·5-in. ; 16—3-in. ; 8 smaller.

ITALY.

BATTLESHIPS.

Andrea Doria. **Caio Duilio.**

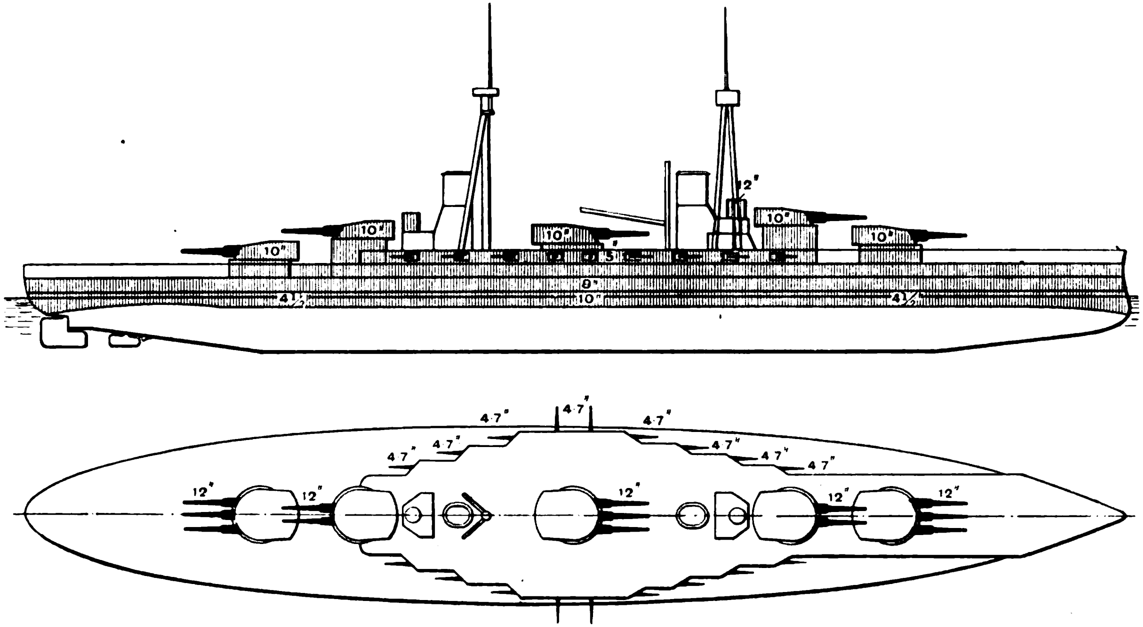


Length (extreme), 575 ft. 9-ins.; Length B.P., 554 ft. 4 ins; Speed, 22 knots; 22,600 tons; Completed, 1915.
Armament, 13—12-in., 16—6-in., 13—14-pr., 6—14-pr. H.A., 2 M., 4 L.

ITALY.

BATTLESHIPS.

Conte di Cavour **Giulio Cesare.**

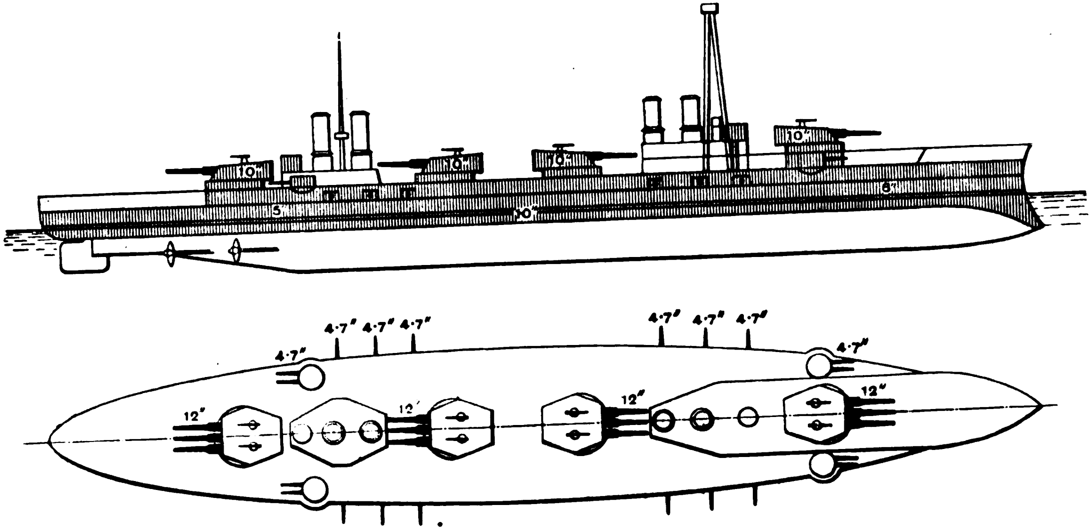


Length (extreme), 575 ft. 9 ins.; Length B.P., 554 ft. 4 ins.; Speed, 22 knots; 22,023 tons; Completed, 1914-1915.
Armament, 13—12-in.; 18—4·7-in.; 13—14-pr.; 6—14-pr. H.A.

ITALY.

BATTLESHIP.

Dante Alighieri

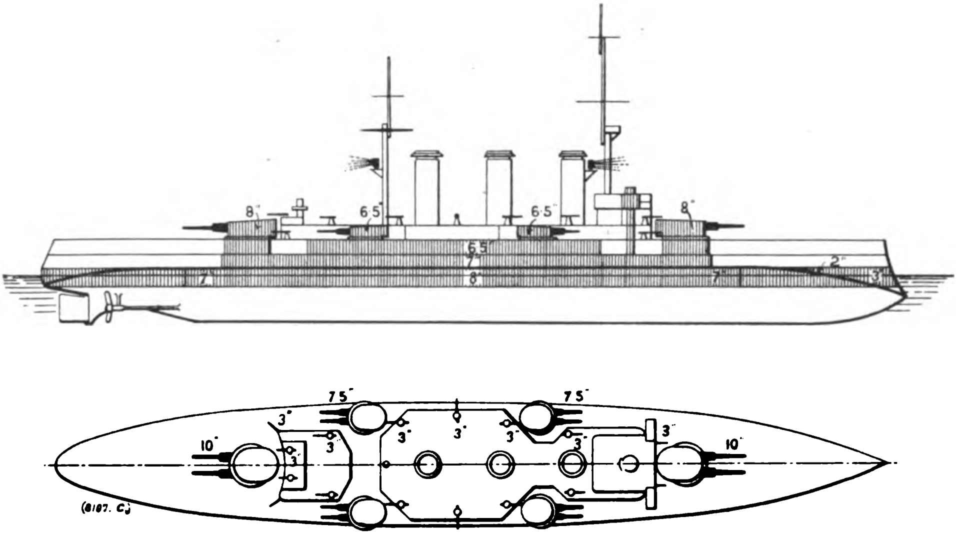


Length (extreme), 549 ft. 6 ins.; Length B.P., 519 ft. 8¼ ins.; Speed, 23 knots; 19,400 tons; Completed, 1912.
Armament, 12—12-in.; 20—4·7-in.; 12—14-pr.; and 6—14-pr. H.A.

ITALY.

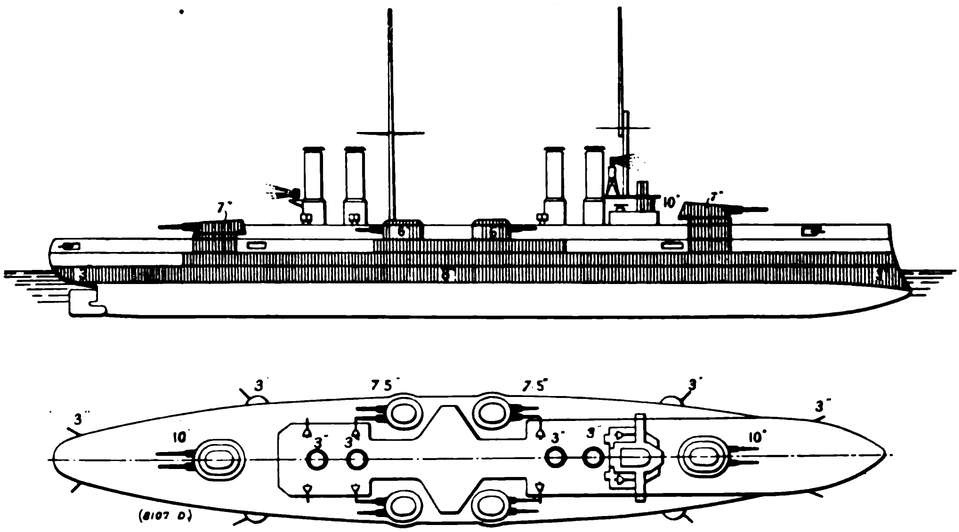
ARMOURED CRUISERS.

Pisa.



Length (extreme), 460 ft. 11 ins. ; Length B.P., 426 ft. 6 ins. ; Speed, 23 knots ; 10,600 tons ; Completed, 1908.
Armament, 4—10-in. ; 8—7·5-in. ; 14—14-pr. ; 6—14-pr. H.A.

S. Giorgio. S. Marco.

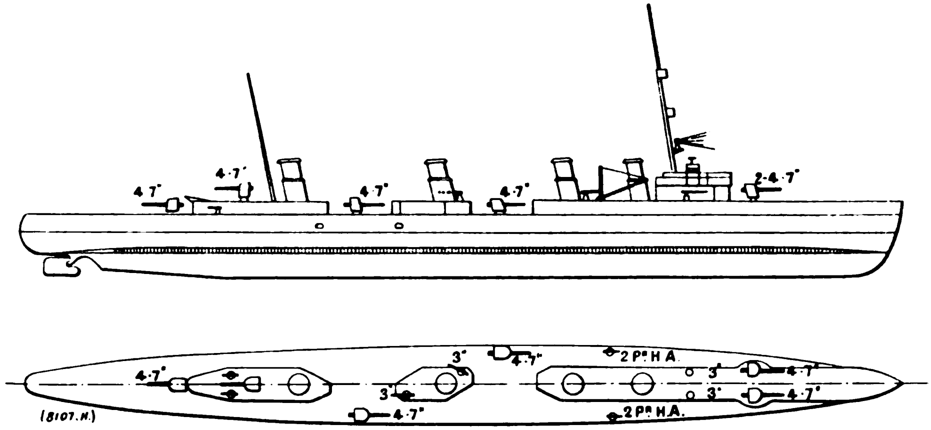


Length (extreme), 462 ft. 2 ins. ; Length B.P., 429 ft. 11 ins. ;
Speed, 22·5 and 23 knots ; 10,800 and 10,000 tons ; Completed, 1910.
Armament, 4—10-in. ; 8—7·5-in. ; 10—14-pr. ; 6—14-pr. H.A.

ITALY.

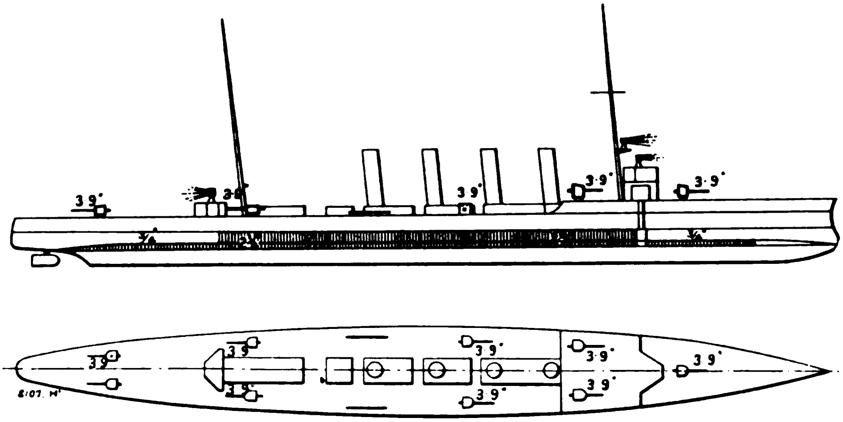
LIGHT CRUISERS.

Marsala. **Nino Bixio.**



Length (extreme), 460 ft.; Length B.P., 430 ft.; Speed, 28 knots; 3,600 tons; Completed, 1914.
Armament, 6—4·7-in; 6—14-pr.; 2—2-pr. H.A.; 2 above-water 18-in torpedo tubes; 150 mines.

Venezia (*ex-Austrian* **Saida**). **Brindisi** (*ex-Austrian* **Helgoland**).



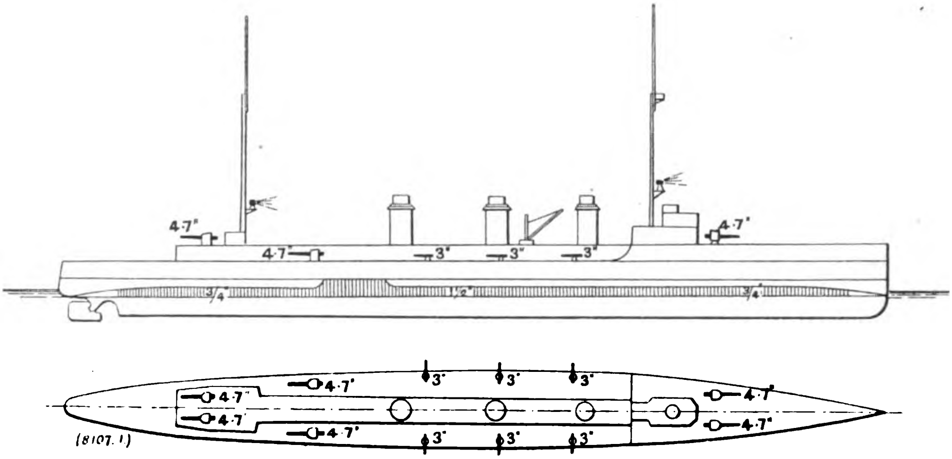
Length (extreme), 430 ft.; Speed, 27 knots; 3,440 tons; Completed, 1914-15.
Armament, 9—3·9-in.; 1—3-in. H.A.; 3 twin above-water torpedo tubes.

NOTE.—Thionville (*ex*-Novara), sister ship, allocated to France.

ITALY.

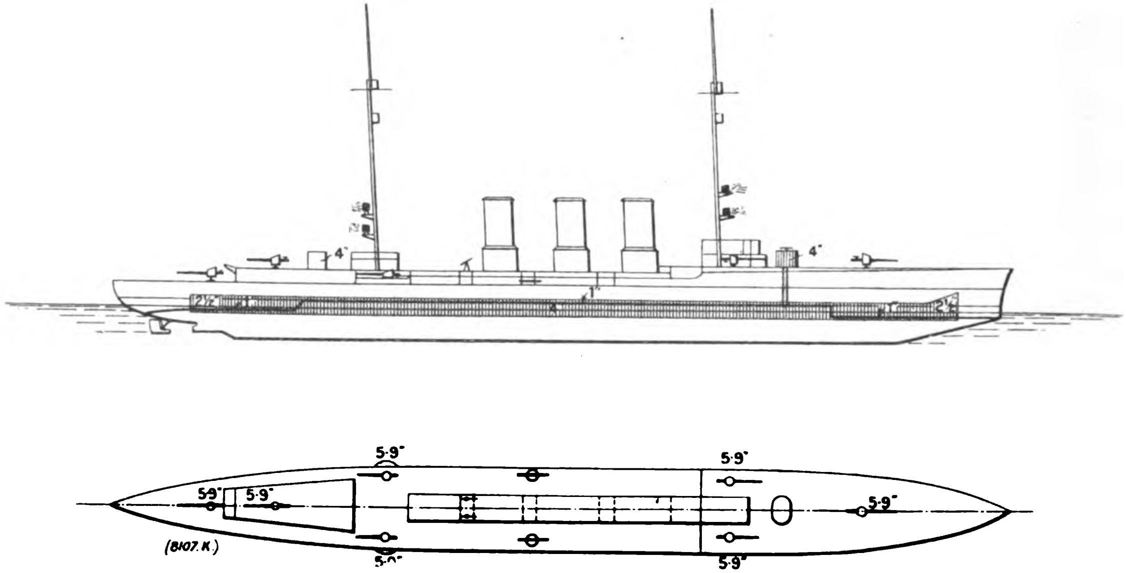
LIGHT CRUISERS.

Quarto.



Length (extreme), 431 ft. 9 ins. ; Length B.P., 413 ft. 5 ins. ; Speed, 28 knots ; 3,220 tons ; Completed 1912.
Armament, 6—4·7-in. ; 6—14-pr. ; 2—2-pr. H.A. ; 2 above-water 18-in. torpedo tubes ; 150 mines.

Ancona (*formerly German* Graudenz).



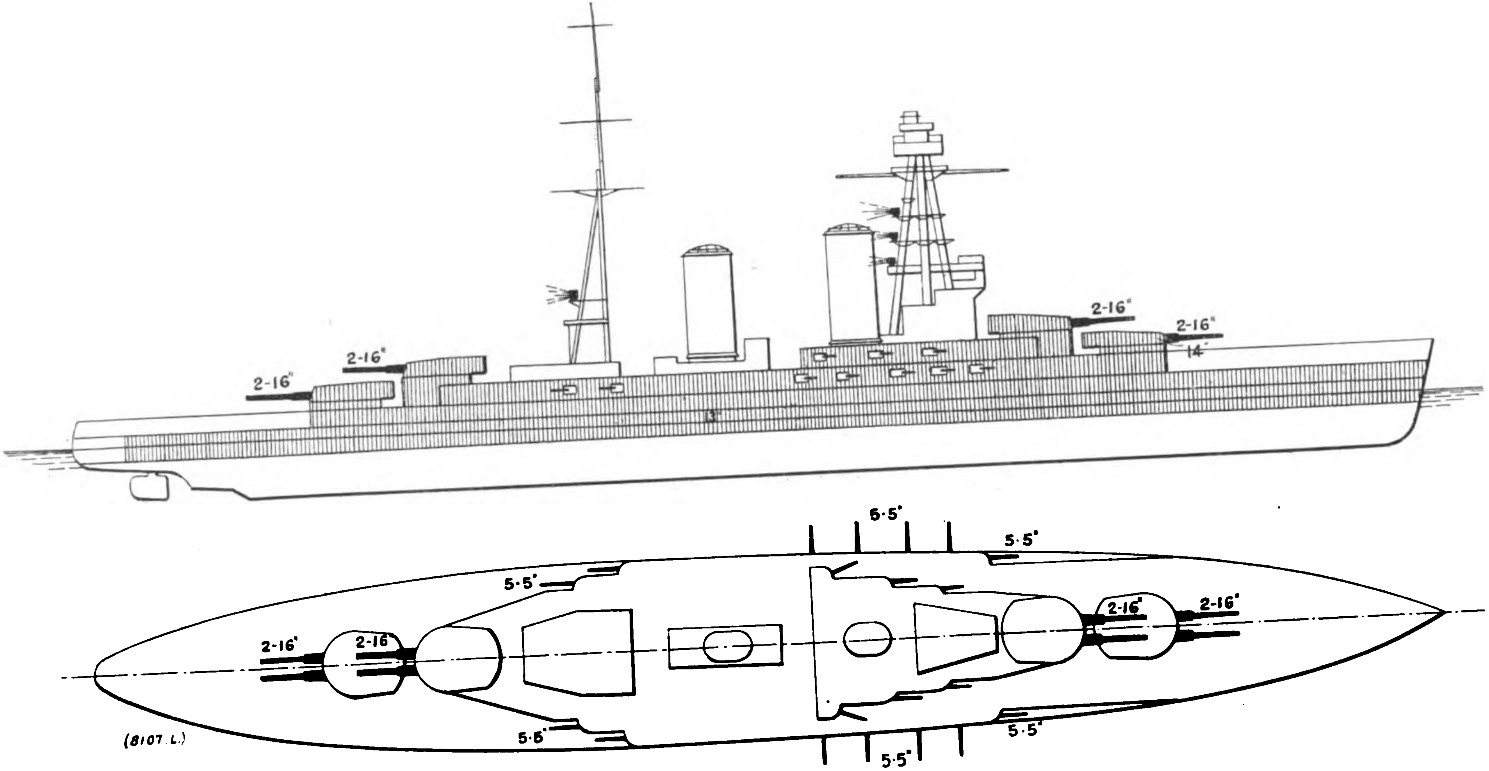
Length (extreme), 456 ft. ; Speed, 27½ knots ; 4,842 tons ; Completed, 1914.
Armament, 7—5·9-in. ; 2—22-pr. H.A. ; 2 submerged and 2 above-water torpedo tubes ; 120 mines.

NOTE.—Italy has also the *ex*-German Light Cruisers Pillau (renamed Bari) and Strassburg (renamed Taranto) Taranto has the same armament as Ancona, except that the superposed gun aft is placed just abaft the aft funnel (Taranto has 4 funnels). Bari has 8—5·9-in. guns, two being mounted abreast forward and aft. Mulhouse (*ex*-Stralsund), sister ship to Taranto, was allocated to France.

JAPAN.

BATTLESHIPS.

Nagato. **Mutsu.**

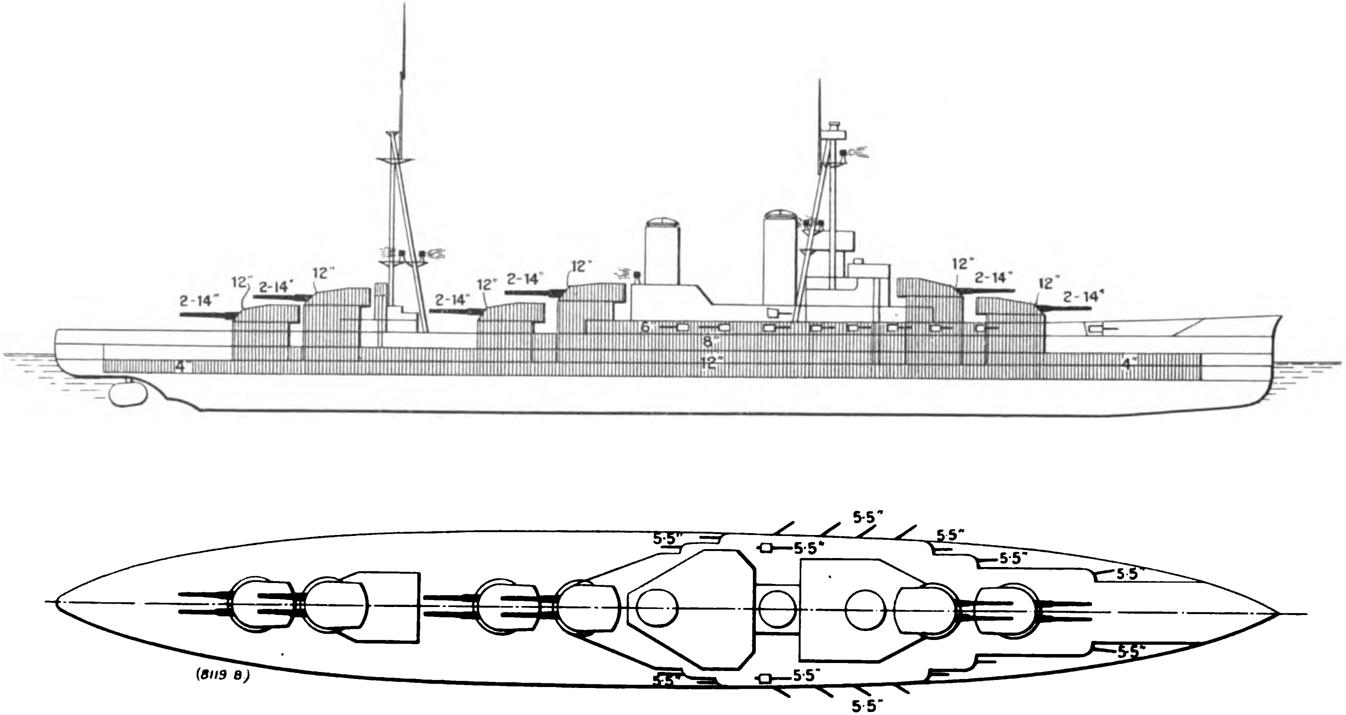


Length (extreme), 700 ft. ; Length B.P., 660 ft. 7 ins. ; Speed, 23½ knots ; 33,800 tons ; Completed, 1920-1921.
Armament, 8—16-in. ; 20—5·5-in. ; 4—12-pr. H.A. ; 4 above-water and 4 submerged 21-in. torpedo tubes.

JAPAN.

BATTLESHIPS.

Ise. **Hyuga.**

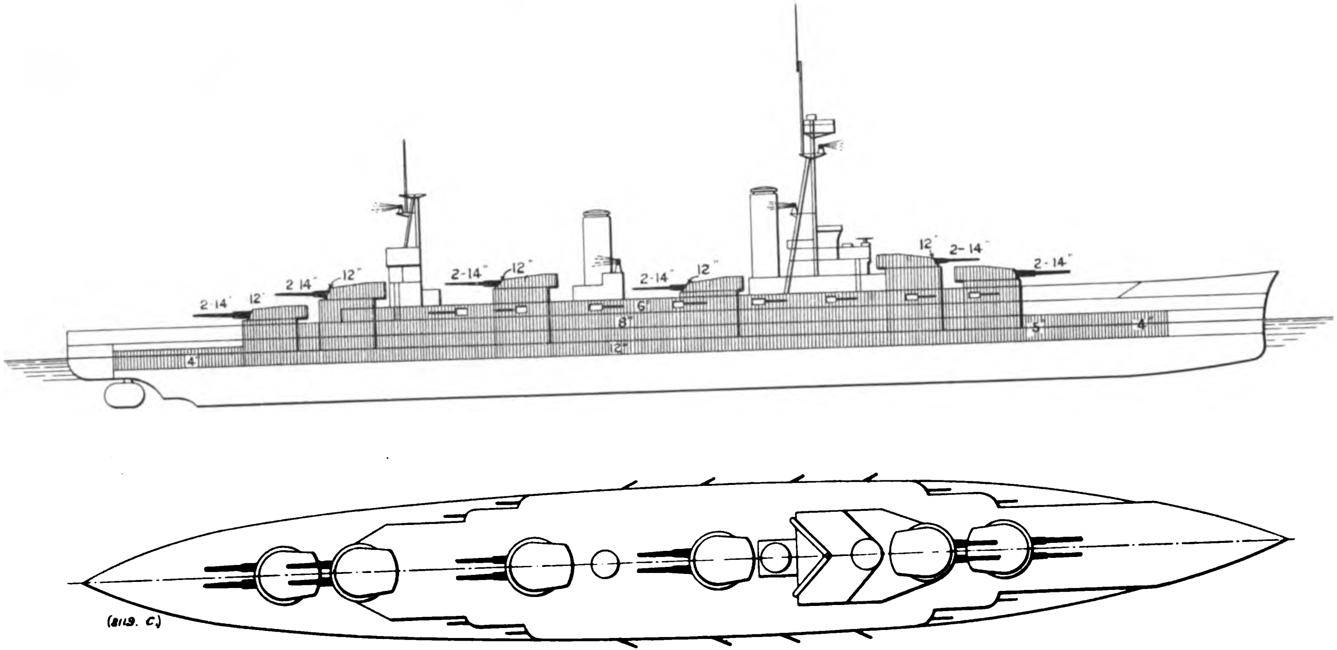


Length (extreme) 683 ft. ; Length B.P., 640 ft. ; Speed, 23 knots ; 31,260 tons ; Completed 1917-18.
Armament, 12—14-in ; 20—5·5-in. ; 4—12-pr. H.A. ; 6 submerged 21-in. torpedo tubes.

JAPAN.

BATTLESHIPS.

Fuso. **Yamashiro.**

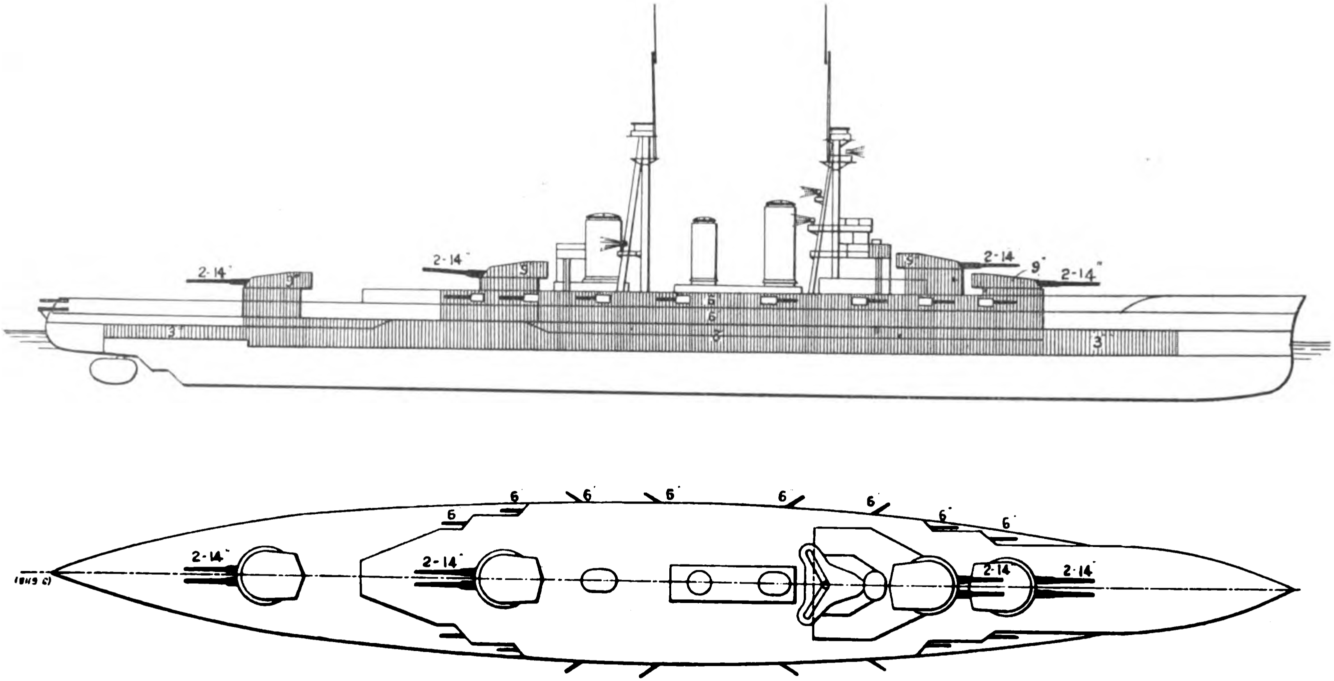


Length (extreme), 673 ft.; Length B.P., 630 ft.; Speed, 22·5 knots; 30,600 tons; Completed, 1915–17.
Armament, 12—14-in.; 16—6-in.; 4—12-pr. H.A.; 6 submerged 21-in. torpedo tubes.

JAPAN.

BATTLE-CRUISERS.

Kongo. **Hiyei.** **Haruna.** **Kirishima.**



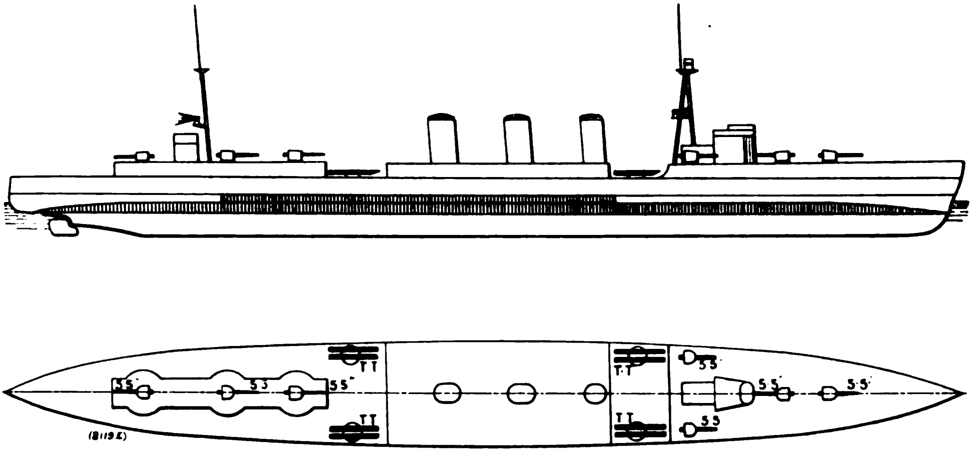
Length (extreme), 704 ft. ; Length B.P., 653 ft. 6 ins. ; Speed, 27·5 knots ; 27,500 tons ; Completed, 1913-15.
Armament, 8—14-in. ; 16—6-in. ; 4—12-pr. H.A. ; 8 submerged, 21-in. torpedo tubes.

NOTE.—Funnels as shown for Kongo ; in the other three ships the forward funnel is slightly farther aft.

JAPAN.

LIGHT CRUISERS.

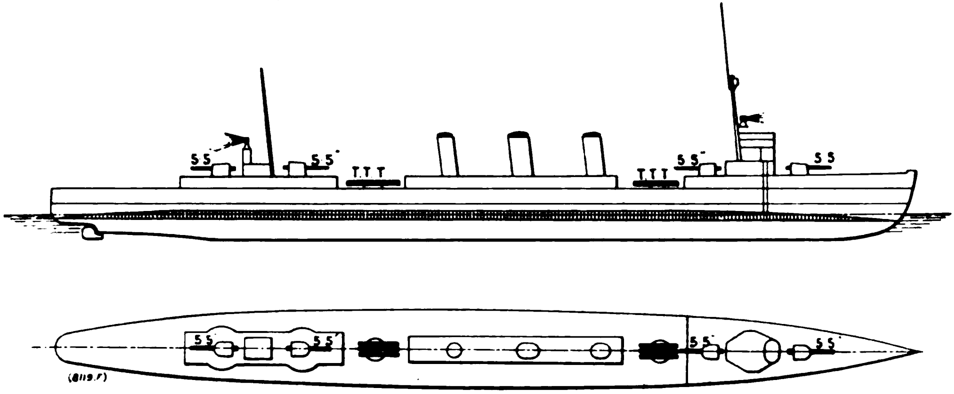
Oh-i. **Kiso.** **Kitakami.** **Tama.** **Kuma.**



Length (extreme), 535 ft. ; Length B.P., 500 ft. ; Speed, 33 knots ; 5,500 tons ; Completed, 1920-21. Armament, 7—5·5-in. ; 2—12-pr. H.A. ; 4 twin above-water 21-in torpedo tubes.

LIGHT CRUISERS.

Tatsuta. **Tenryu.**

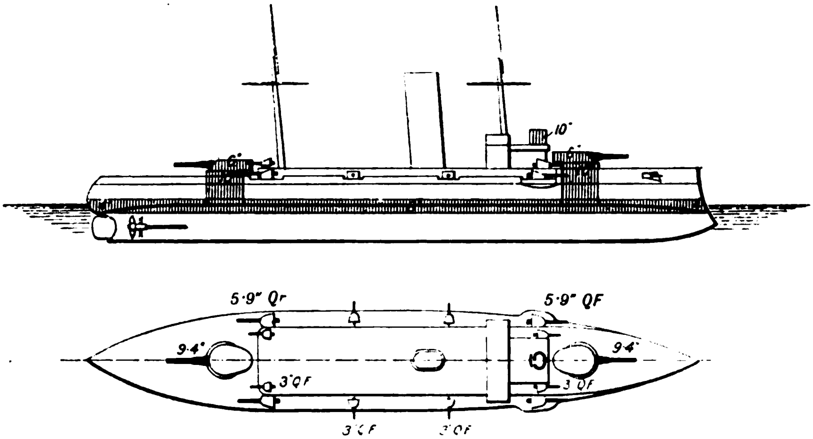


Length (extreme), 450 ft. ; Speed, 31 knots ; 3,500 tons ; Completed, 1919. Armament, 4—5·5-in. ; 1—12-pr. H.A. ; 2 triple above-water torpedo tubes.

NETHERLANDS.

COAST DEFENCE SHIPS.

De Ruyter. **Hertog Hendrik.** **Marten Tromp**

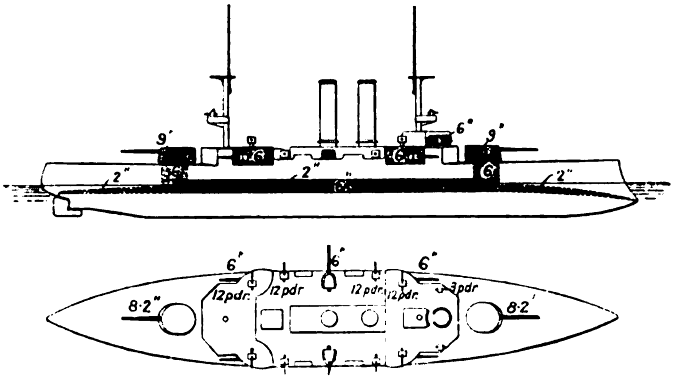


Length, 316¾-330 ft. ; 5000—5216 tons ; Speed, 14·5 knots ; Completed, 1903—1906.
Armament, De Ruyter and Hertog Hendrik : 2—9·4-in. ; 6—5·9-in. ; 4—2·9-in. ; 4 or 6 small.
Marten Tromp : 2—9·4-in. ; 4—5·9-in. ; 8—2·9-in. ; 6 small

NORWAY.

COAST DEFENCE SHIPS.

Norge. **Eidsvold**

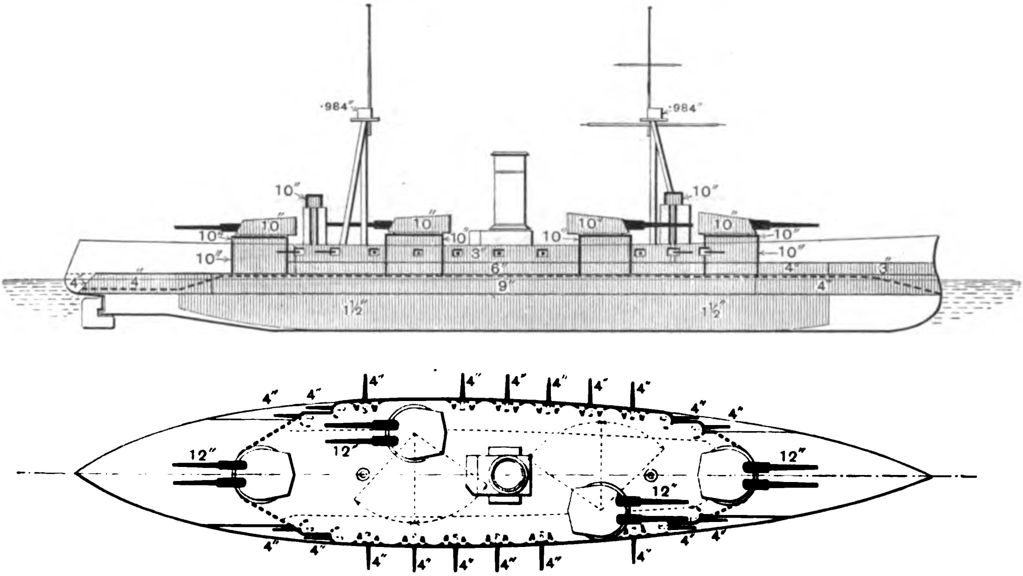


Length, 290 ft. ; 4233 tons ; Speed, 16·9 knots ; Completed, 1901.
Armament, 2—8·2-in. ; 6—6-in. ; 8—12-pr. ; 6 small.

SPAIN.

BATTLESHIPS.

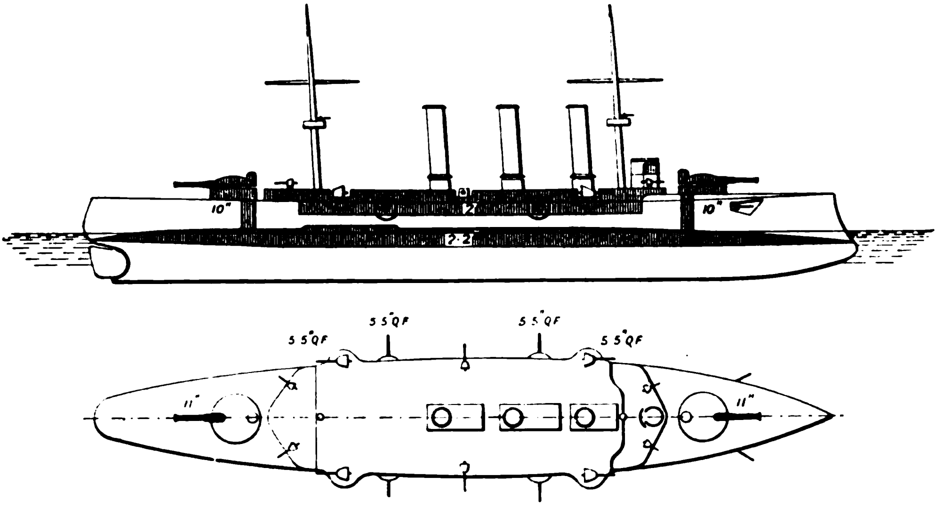
Alphonso XIII. **España.** **Jaime I.**



Length, 459–433 ft. ; 15,460–15,700 tons ; Speed, 19·5 knots to 20·2 knots ; Completed, 1913-1916.
Armament, 8—12-in. ; 20—4-in. ; 6 small.

ARMOURED CRUISER.

Emperador Carlos V.

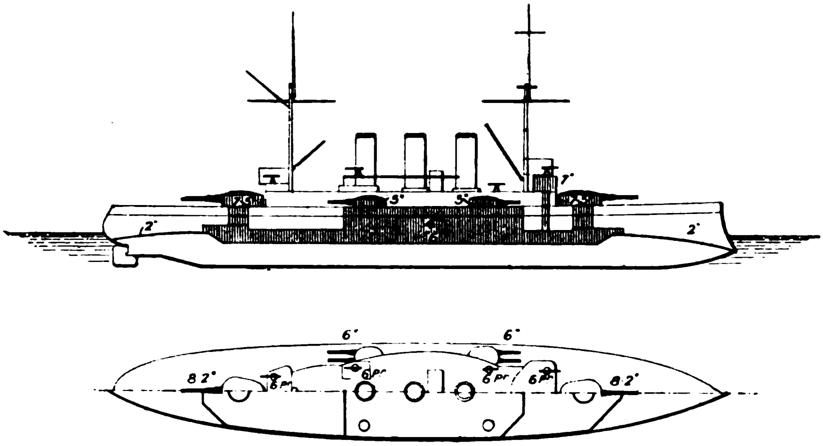


Length, 404 ft. ; 9900 tons ; Speed, 19 knots ; Completed, 1898 ;
Armament, 2—11-in. ; 8—5·5-in. ; 4—4·1-in. ; 22 small.

SWEDEN.

BATTLESHIP.

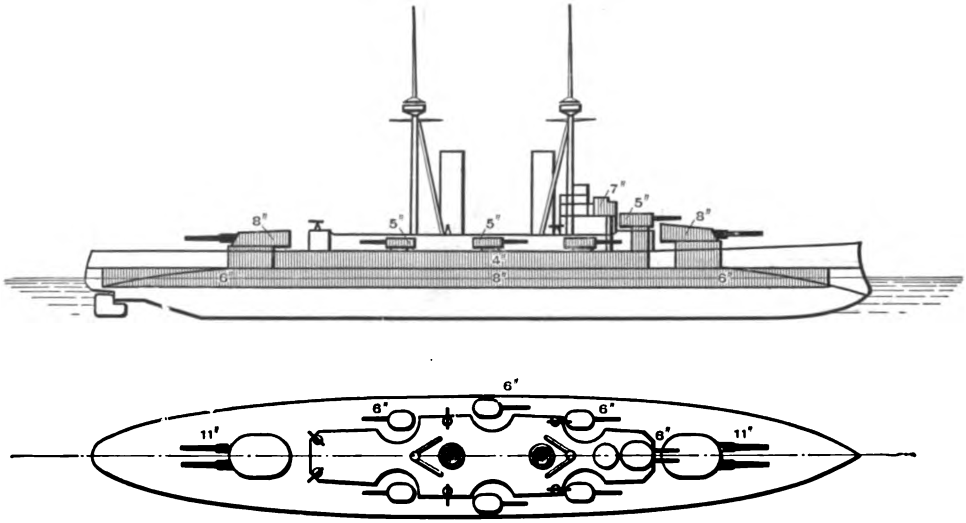
Oscar II.



Length, 313·6 ft. ; 4658 tons ; Speed, 18 knots ; Completed, 1907.
Armament, 2—8·2-in. ; 8—6-in. ; 14 small.

ARMOURED CRUISERS.

Drottning Victoria. **Gustav V.** **Sverige.**

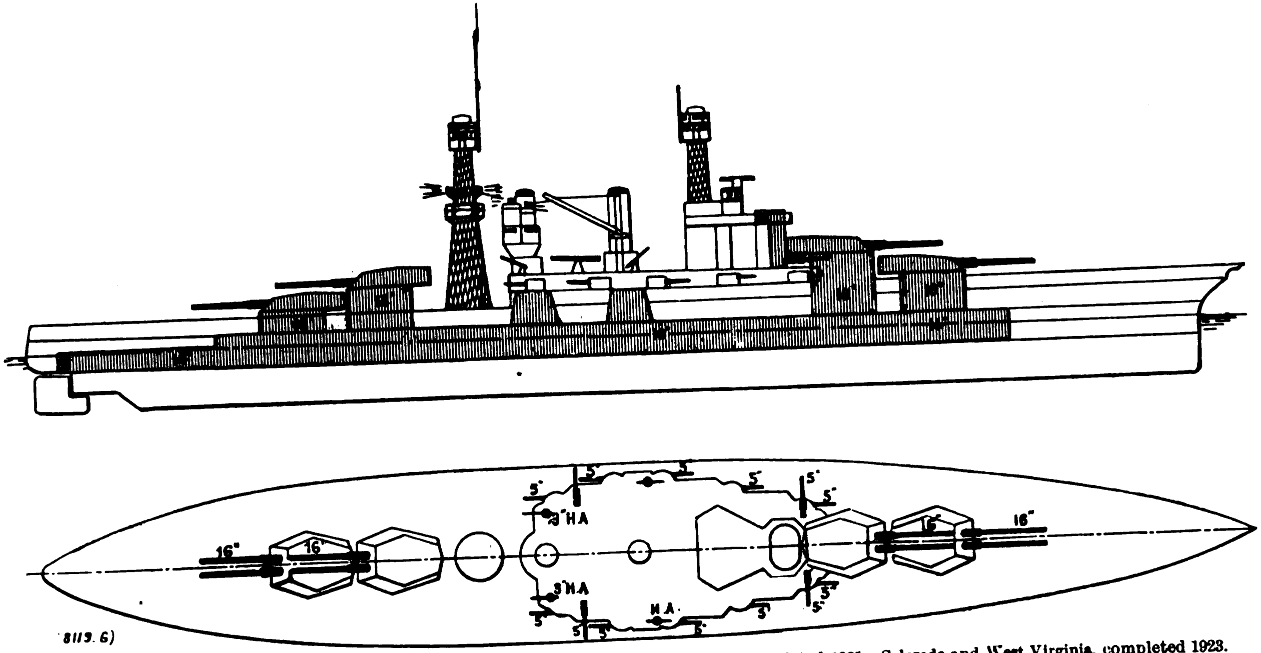


Length, 396·7 ft. ; 7605 tons ; Speed, 22 knots ; Completed, 1917–1922.
Armament, 4—11-in. ; 8—6-in. ; 6—12-pr. ; 4 small.

UNITED STATES.

BATTLESHIPS.

Colorado. **Maryland.** **West Virginia.**



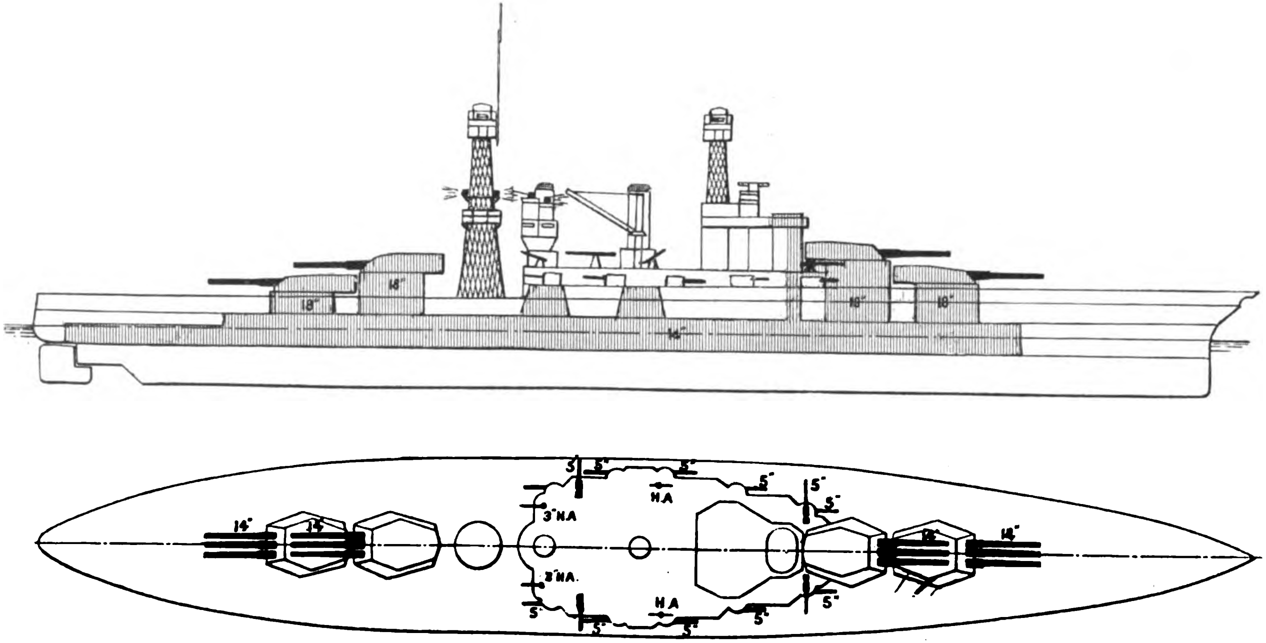
8113.6)

Length (extreme), 624 ft.; Length W.L., 600 ft.; Speed, 21 knots; 32,600 tons; Maryland, completed 1921; Colorado and West Virginia, completed 1923.
Armament, 8—16-in.; 12—5-in.; 8—3-in. H.A.; 4—6-pr; 2 submerged 21-in. torpedo tubes.

UNITED STATES.

BATTLESHIPS.

California **Tennessee.**

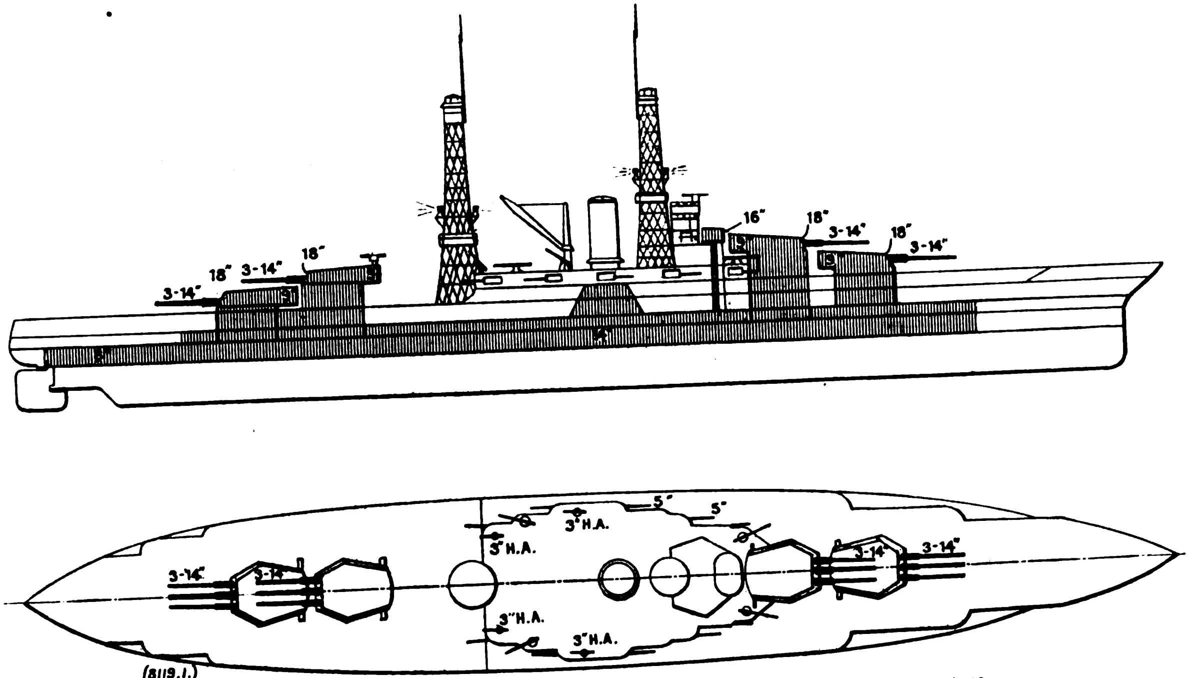


Length (extreme), 624 ft. ; Length W.L., 600 ft. ; Speed, 21 knots ; 32,300 tons ; Completed, 1920-21.
Armament, 12—14-in. ; 12—5-in. ; 8—14-pr. H.A. ; 4—6-pr. : 2 submerged 21-in. torpedo tubes.

UNITED STATES.

BATTLESHIPS.

Idaho. **New Mexico.** **ssissippi.**



(8119.1.)

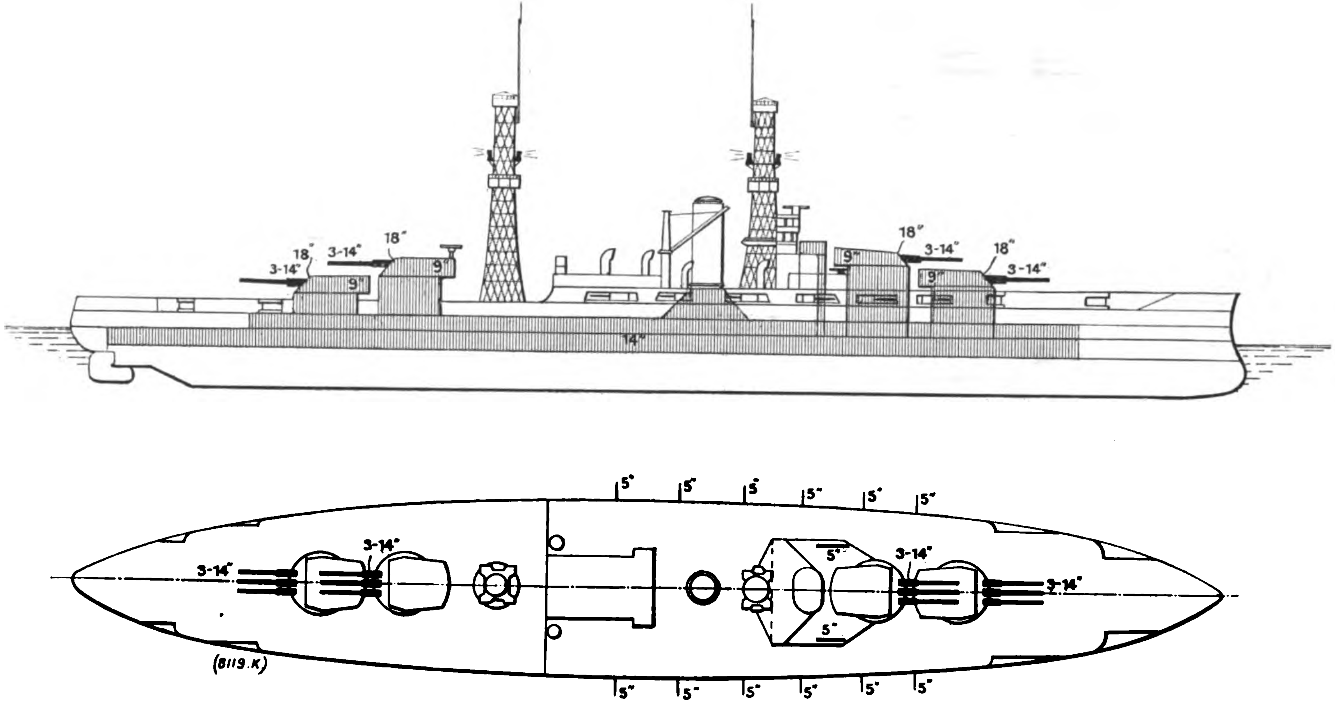
Length (extreme), 624 ft.; Length W.L., 600 ft.; Speed, 21 knots; 32,000 tons; Completed, 1917-19.
Armament, 12—14-in.; 12—5-in.; 8—14-pr. H.A.; *4—6-pr.; 2 submerged 21-in. torpedo tubes.

* Idaho, 4—3-pr.

UNITED STATES.

BATTLESHIPS.

Arizona. **Pennsylvania.**

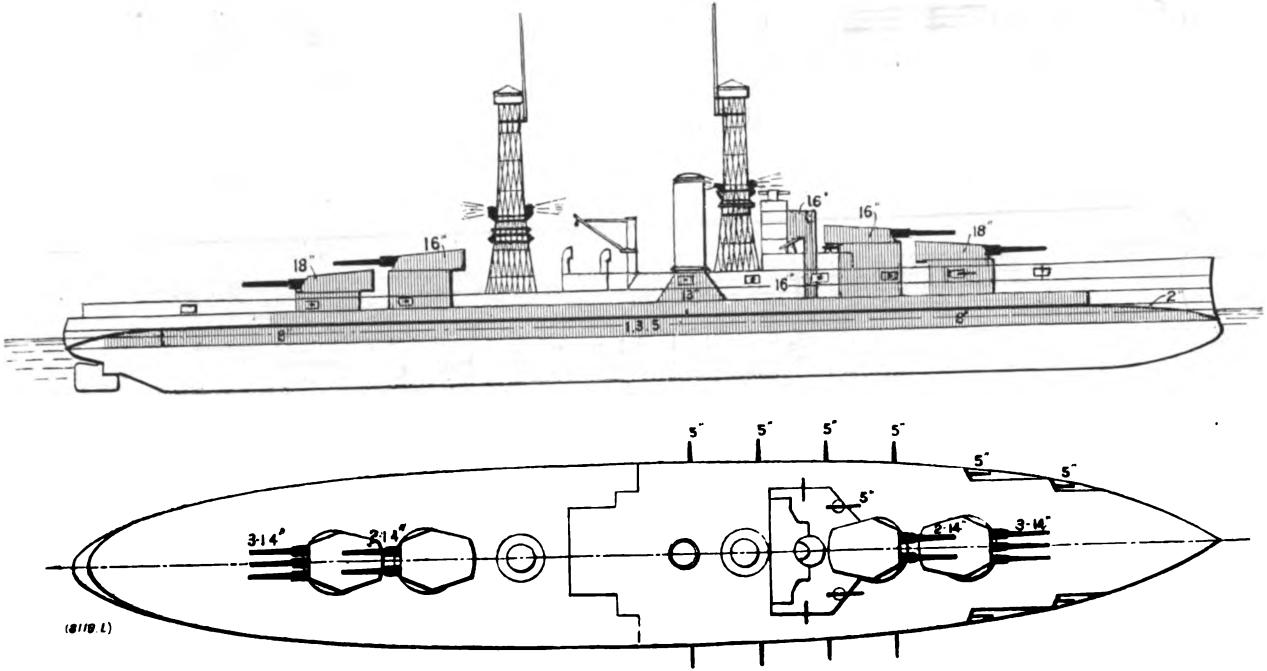


Length (extreme), 608 ft. ; Length B.P., 596 ft. ; Speed, 21 knots ; 31,400 tons ; Completed, 1916.
Armament, 12—14-in. ; 14—5-in. ; 8—3-in. H.A. ; 4—3-pr. ; 2 submerged 21-in. torpedo tubes.

UNITED STATES.

BATTLESHIPS.

Nevada. **Oklahoma.**

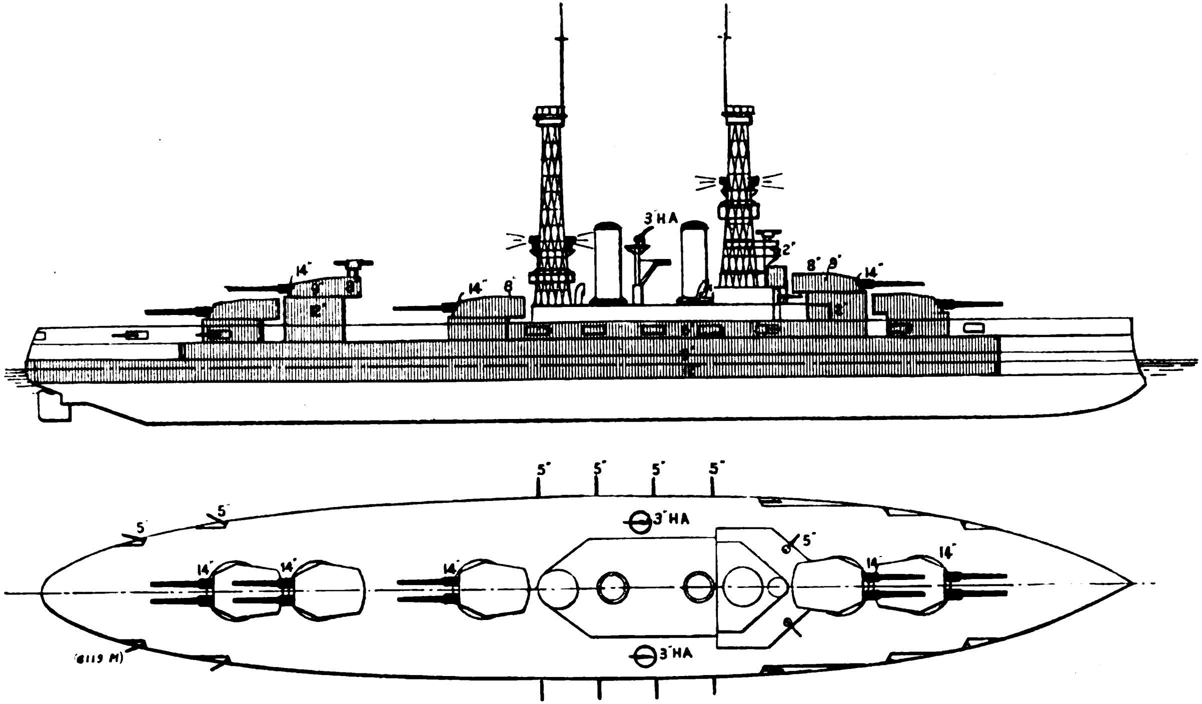


Length (extreme), 583 ft. ; Length W.L., 575 ft.; Speed, 20·5 knots ; 27,500 tons ; Completed, 1916.
Armament. 10—14-in. ; 12—5-in. ; 8—3-in. H.A. ; 4—3-pr. ; 2 submerged 21-in. torpedo tubes.

UNITED STATES.

BATTLESHIPS.

New York. **Texas**

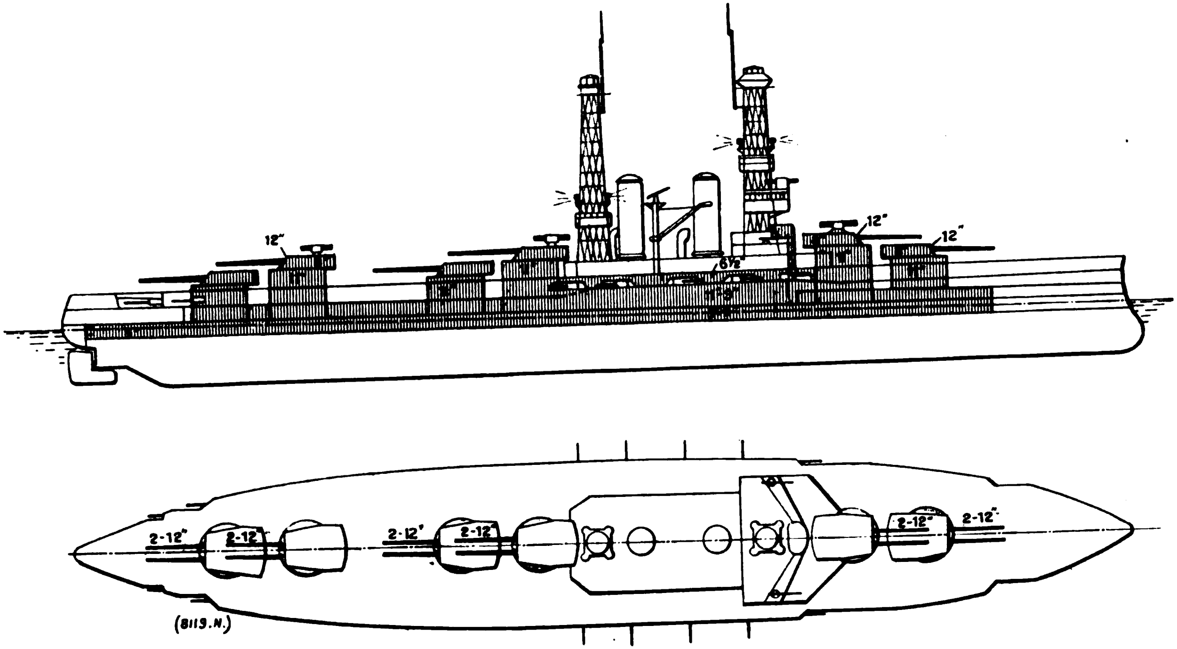


Length (extreme), 573 ft. ; Length W.L., 565 ft. ; Speed, 21 knots ; 27,000 tons ; Completed, 1914.
Armament, 10—14-in. ; 16—5 in. ; 8—3-in. H.A. ; 4—3-pr. ; 4 submerged 21-in. torpedo tubes.

UNITED STATES.

BATTLESHIPS.

Arkansas. **Wyoming.**



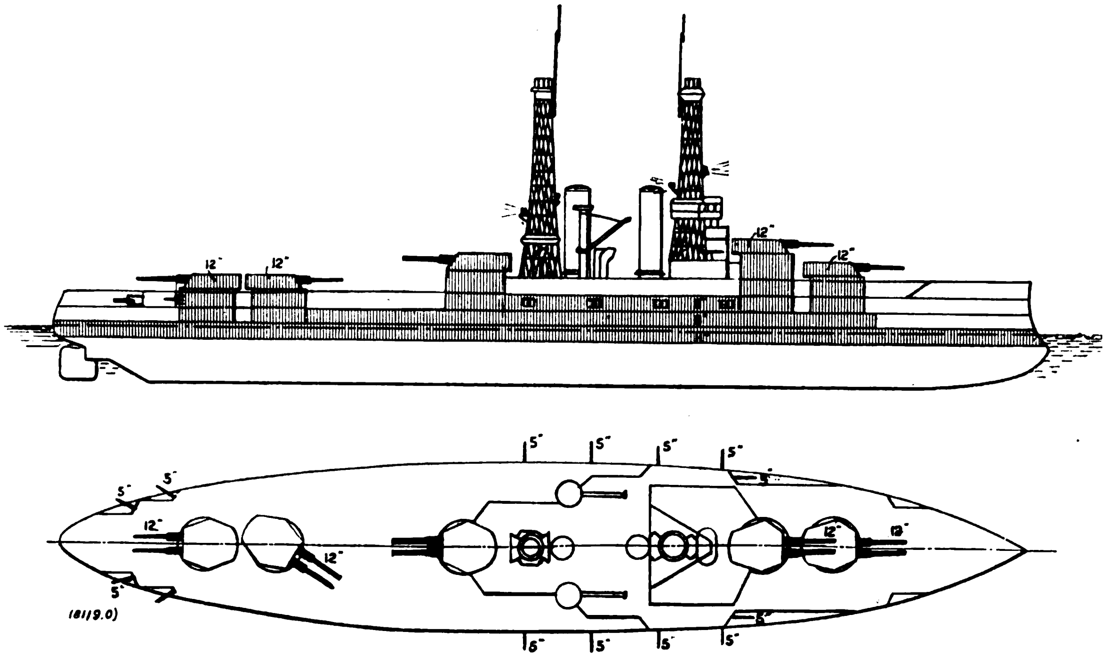
Length (extreme), 562 ft. ; Length W.L., 554 ft. ; Speed, 20·5 knots ; 26,000 tons ; Completed, 1912. Armament, 12—12 in. ; 16—5 in. ; 8—3 in. H.A. ; 4 or 6*—3-pr. ; 2 submerged 21-in. torpedo tubes.

* Wyoming,

UNITED STATES.

BATTLESHIPS.

Utah. **Florida.**



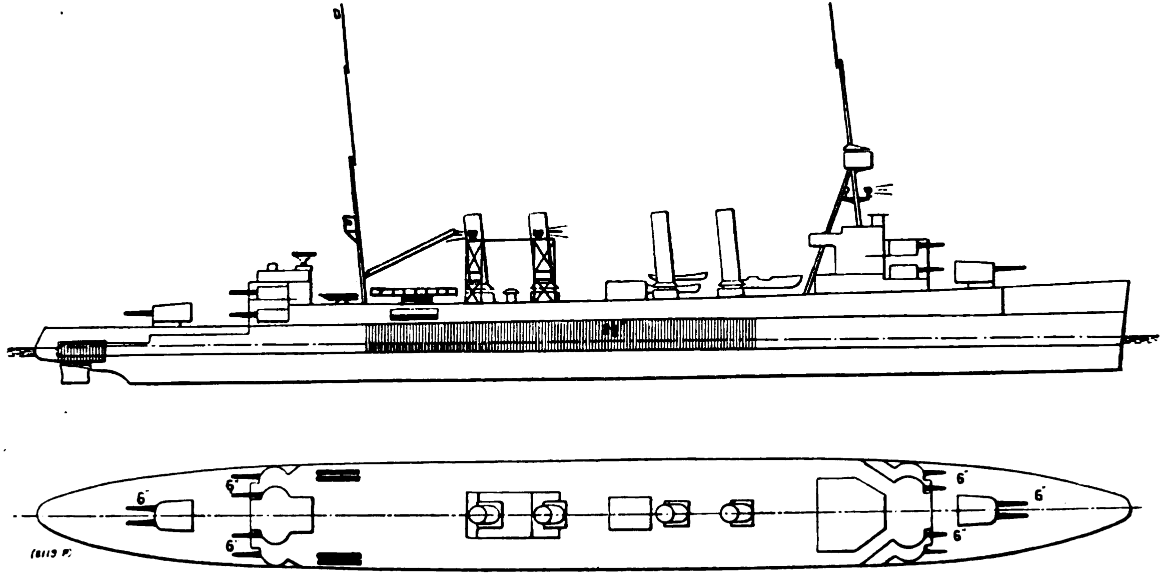
Length (extreme), 521 ft. 6 ins. ; Length W.L., 510 ft. ; Speed, 20·75 knots ; 21,825 tons ; Completed, 1911.
Armament, 10—12-in. ; 16—5-in. ; 8—3-in. H.A. ; 4 or *6—3-pr. ; 2 submerged 21-in. torpedo tubes.

* Florida.

UNITED STATES.

SCOUT CRUISERS.

Cincinnati. **Concord.** **Detroit.** **Marblehead.** **Memphis.** **Milwaukee.** **Omaha.**
Raleigh. **Richmond.** **Trenton.**



Length (extreme), 555 ft. 6 in. ; Length W.L., 550 ft. ; Speed, 33·7 knots ; 7,500 tons ; 4 completed in 1923 ; others building.
Armament, 12—6 in. ; 4—3-in. H.A. ; 2—3-pr. ; 2 twin and 2 triple above-water 21-in. torpedo tubes.

BRITISH AND FOREIGN ORDNANCE TABLES.

VICKERS' GUNS AND MOUNTINGS.

This Table is supplied by the Manufacturers.

		37 m/m Auto.	37 m/m Auto.	40 m/m Auto.	3-pdr. Semi-Auto.	6-pdr. Semi-Auto.	3-in. Semi-Auto.	4-in. Semi-Auto.	4-in. Semi-Auto.	4-in. B.L.	4·7-in. B.L.	4·7-in. B.L.	4·7-in. Q.F. Naval Howitzer.	5·118-in. B.L.	6-in. B.L.	6-in. B.L.	6-in. Semi-Auto.
		30 cal.	42·5 cal.	40 cal.	50 cal.	50 cal.	50 cal.	40 cal.	45 cal.	50 cal.	45 cal.	48·5 cal.	18 cal.	54 cal.	45 cl.	50 cal.	50 cal.
Construction	ins.	S.	S.	S.	S.	S.	S.	S. & W.	S.& W.	S. & W.	S.& W.	S.	S.	S.	S. & W.	S. & W.	S. & W.
Diameter of Bore	ins.	1·457	1·457	1·575	1·85	2·244	3	4	4	4	4·724	4·724	4·724	5·118	6	6	6
Length of Bore	ins.	43·5	62	62	92·5	112·2	150	160	180	201·15	212·6	228·45	85	276·37	269·5	300	300
Length of Gun	ins.	73·75	94	95·7	98·9	118·6	157	166·6	187·8	208·45	220	236·2	89·9	281·5	279·228	310·07	311·17
Weight of Gun		lb. 432	lb. 551	lb. 616	cwt. 6	c. q. 9 1	cwt. 19	cwt. 25	cwt. 43	cwt. 42	t. c. 3 4	t. c. 3 2	c. q. 11 1½	t. c. q. 5 3 2	t. c. q. 7 8 2	tons 8	t. c. 8 19
Weight of Projectile	lb.	1	1·5	2	3·3	6	12·5	31	31	31	45	45·14	45	81·26	100	100	100
Muzzle Velocity	f.s.	1800	2100	2000	2800	2600	2700	2300	2700	3030	2800	3050	1200	2700	2900	3100	2900
Muzzle Energy	f.t.	22·5	46	55·5	180	280	630	1135	1565	1975	2445	2910	450	4110	5830	6665	5830
Penetration of Wrought Iron Plate at Muzzle, Gavre formula. Uncapped Projectiles	ins.	..	..	..	6·7	7·5	9·65	10·8	13·6	16	15·9	17·8	..	20·8	22·6	24·8	22·6
Rounds per minute		200	200	200	30	28	25	20	18	15	12	12	10	10	10	10	8
Weight of Mounting complete with Shield		lb. 800	lb. 800	lb. 1000	c. q. lb. 11 2 5	c. q. lb. 17 3 10	t. c. q. lb. 1 3 1 10	t. c. q. lb. 2 9 2 21	t. c. q. 2 18 3	t. c. q. lb. 3 5 0 27	t. c. q. 3 15 0	t. c. q. lb. 5 9 1 21	t. c. q. lb. 4 1 2 11	t. c. q. l. 12 9 3 13	t. c. q. lb. 12 9 2 3	t. c. q. 14 17 2	t. c. q. lb. 12 0 1 24
Weight of Shield		..	..	..	1 0 20	1 2 10	2 0 14	7 2 0	7 2	14 1 13	15 2	1 12 2 0	2 0 0 4	4 4 3 16	4 4 3 16	6 5 0	5 5 1 15
Thickness of Shield	ins.	..	..	..	·22	·25	·25	·144	·144	·25	·25	3	1·9	1·5 & 1	1·5 & 1	4 to 1·2	3 to 1·2
Angle of Elevation	deg.	80	80	80	20	20	20	30	30	30	30	30	70	30	30	30	15
Angle of Depression	deg.	10	10	5	10	10	10	10	10	10	10	10	5	5	5	7	7

		8-in. B.L.	9·2-in. B.L.	9·2-in. B.L.	10-in. B.L.	10-in. B.L.	11-in. B.L. Naval Howitzer.	12-in. B.L.	12-in. B.L.	13·5-in. B.L.	14-in. B.L.	14-in. B.L.	15-in. B.L.	15-in. B.L.	16-in. B.L.	16-in. B.L.	16-in. B.L.
		48·52 cal.	45 cal.	50 cal.	45 cal.	48·6 cal.	8 cal.	45 cal.	50 cal.	45 cal.	45 cal.	50·42 cal.	40 cal.	45 cal.	40 cal.	43·65 cal.	45 cal.
Construction		S.	S. & W.	S. & W.	S. & W.	S.	S.	S. & W.	S. & W.	S. & W.	S. & W.	S.	S. & W.	S. & W.	S. & W.	S.	S. & W.
Diameter of Bore	ins.	8	9·2	9·2	10	10	11	12	12	13·5	14	14	15	15	16	16	16
Length of Bore	ins.	388·2	414	461·4	450	486	88	540	600	607·5	630	705·88	600	675	640	698·45	720
Length of Gun	ins.	400	427·03	474·4	464·6	500	96·6	557·55	617·7	625·9	648·4	728	620·3	695·3	661·25	720	741·25
Weight of Gun		t. c. q. 14 3 1	t. c. q. 26 11 3	t. c. q. 28 6 2	t. c. 34 17	t. c. 27 17	t. c. 1 18	t. c. 57 14	t. c. 66 14	t. c. q. 76 12 1	t. c. 83 9	tons 82	t. c. 82 10	tons 97	tons 100	t. c. 107 14	tons 117
Weight of Projectile	lb.	247·4	380	380	500	496·6	350	850	850	1400	1488	1648	1900	1900	2240	2461·2	2240
Muzzle Velocity	f.s.	3000	2800	2900	2780	2863	585	2850	3010	2500	2525	2700	2350	2500	2350	2500	2450
Muzzle Energy	f.t.	15440	20660	22160	26800	28225	682	47875	53400	60675	65790	83305	72750	82340	85780	106665	93230
Penetration of Wrought Iron Plate at Muzzle. Gavre Formula. Uncapped Projectile	ins.	33·2	35·3	37	38·9	40·2	—	48·3	52·1	50	51·5	60·7	51	56	54	63	57
Rounds per minute		6	4	4	3	3	4	2	2	1·5	1·35	1·35	1·2	1·2	1·2	1·2	1·2

Corrected to September, 1923.

VICKERS' GUNS AND MOUNTINGS.

AIRCRAFT AND ANTI-AIRCRAFT GUNS.

—	Aircraft.									Anti-Aircraft.							
	·303-in. Auto.	·5-in. Auto.	1-in. Auto.	37 m/m. 1-pdr. Auto.	40 m/m. 2-pdr. Auto.	37 m/m. Semi-Auto.	40 m/m. Q.F.	40 m/m. Semi-Auto.	6-pdr. Q.F.	37 m/m. 1-pdr. Auto.	37 m/m. 1·5-pdr. Auto.	40 m/m. 2-pdr. Auto.	3-pdr. Semi-Auto.	3-in. Q.F.	3·3-in. Q.F.	4-in. Semi-Auto.	4-in. B.L.
	93·7 cal.	60 cal.	30 cal.	22 cal.	42·5 cal.	26·1 cal.	25·1 cal.	40 cal.	25 cal.	30 cal.	42·5 cal.	40 cal.	50 cal.	45 cal.	50 cal.	45 cal.	50 cal.
Construction	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S. & W.	S. & W.	S. & W.	S. & W.
Diameter of Bore . . ins.	·303	·5	1	1·457	1·575	1·457	1·575	1·575	2·244	1·457	1·457	1·575	1·85	3	3·3	4	4
Length of Bore . . ,,	28·4	30	30	32·05	62	38·06	39·56	63	56·1	43·5	62	62	92·5	135	165	180	200
Length of Gun . . ,,	41·3	46·5	55	59·7	108	40·25	41·75	65·25	59·5	73·75	94	95·7	98·9	140·25	170·3	187·8	208·45
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	cwt.	c. q.	t. c. q.	t. c.	t. c. q.
Weight of Gun	30	50	110	130	400	110	132	234	284	432	551	616	6	18 3	1 13 2	1 16	2 1 3
Weight of Projectile . . lb.	174 grs.	570 grs.	·441	1	2	1·5	2	2	6	1	1·5	2	3·3	12·5	21	31	31
Muzzle Velocity . . f.s.	2400	2600	1542	1200	2000	1200	1200	2300	1200	1800	2100	2000	2800	2600	2400	2700	3030
Muzzle Energy . . f.t.	1	3·8	7·25	10	55·5	15	20	73	60	22·5	46	55·5	180	585	840	1565	1975
Rounds per minute	500 to 1000	300 to 1000	200	150	100	—	—	—	—	200	200	200	30	25	20	18	15
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	c. q. l.	t. c. q. l.	t. c. q. l.	t. c. q. l.	t. c. q. l.
Weight of Mounting	—	25	65	100	140	333	130	432	185	800	800	1000	18 2 3	2 8 3 0	4 8 2 23	5 18 6 0	3 7 2 0
Angle of Elevation . deg.	—	80	40	60	72	30	70	60	60	80	80	80	80	85	85	90	80
Angle of Depression . ,,	—	30	90	60	30	30	40	30	90	10	10	5	5	10	0	5	5

HOWITZERS, FIELD, MOUNTAIN AND LANDING GUNS.

	Howitzers.				Field.					Mountain.		Landing.
	6-in. B.L.	8-in. B.L.	9·2-in. B.L.	12-in. B.L.	3-in. Q.F.	3-in. Q.F.	3·3-in. Q.F.	5-in. B.L.	6-in. B.L.	75-mm. Q.F.	3-in. Q.F.	3-in. Q.F.
	21 cal.	17·3 cal.	17·3 cal.	17·3 cal.	22·9 cal.	33·2 cal.	28·1 cal.	37 cal.	35 cal.	17 cal.	14·3 cal.	22 cal.
Construction	S. & W.	S. & W.	S. & W.	S. & W.	S. & W.	S.	S. & W.	S. & W.	S. & W.	S.	S.	S.
Diameter of Bore . ins.	6	8	9·2	12	3	3	3·3	5	6	2·953	3	3
Length of Bore . ins.	126	138·4	159·16	207·6	68·7	99·5	92·735	185	210	50·2	42·94	66
Length of Gun . ins	134·15	148·3	170·51	222·35	73·26	103·8	96·96	192·25	219·22	53·6	47·28	70·34
	t. c. q.	t. c.	t. c. q.	t. c. q.	c. q.	c. q.	c. q.	t. c. q.	t. c. q.	c. q. l.	c. q. l.	c. q. l.
Weight of Gun	1 19 2	3 7	4 5 2	9 2 2	6 0	7 2	8 2	2 3 1	4 11 2	3 1 10	2 2 4	3 3 4
Weight of Projectile lb.	86	200	290	750	15	14·33	18 5	60	100	14·33	12·5	12·5
Muzzle Velocity . f.s.	1760	1520	1520	1520	1480	1660	1650	2200	2400	1312	1150	1640
Muzzle Energy . f.t.	1845	3205	4645	12015	228	274	350	2015	3995	171	115	233
Rounds per minute	3	2	2	1	25	25	20	4	3	18	15	25
Weight of Mounting complete with Shield	t. c. q. 2 16 2	t. c 5 14	t. c. 11 5	t. c. 36 10	c. q. l. 14 2 14	c. q. l. 14 0 0	c. q. l. 19 2 0	t. c. q. 2 17 0	t. c. q. 5 12 0	c. q. l. 11 3 18	c. q. l. 7 1 6	c. q. l. 9 2 0
Weight of Shield	—	—	—	—	1 2 0	1 0 15	1 3 0	—	—	1 0 12	2 17	1 1 15
Thickness of Shield ins.	—	—	—	—	·125	·144	·125	—	—	·125	·125	·192
Angle of Elevation deg.	42	45	50	65	30	16	37·5	42	38	50	25	23
Angle of Depression deg.	0	0	0	0	5	10	5	0	0	10	15	10

Corrected to September, 1923.

ELSWICK B.L. AND Q.F. GUNS.

This Table is supplied by the Manufacturers.

	Automatic for Aircraft.				Semi-Automatic.			Semi-Automatic.	Non-recoil.		Naval Landing.	Anti-Aircraft.	Anti-Aircraft.	Semi-Automatic	Jointed Gun.		Semi-Automatic.		
Diameter of Bore ....ins.	1·457	1·457	0·9	1·85	1·85	1·85	2·24	2·24	2·24	2·953	3	3*	3	3	3	4	4	4·7	4·7
do. do. ....mm.	37	37	22·86	47	47	47	57	57	57	75	76	76	76	76	76	102	102	120	120
Length of Bore ....cals.	45	40	66	40	46	50	40	50	27	14·13	18·8	28	50	50	19·2	50	40	45	50
	lb.	lb.	lb.	cwts.	cwts.	cwts.	cwts.	cwts.	lb.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.	cwts.
Weight of Gun	340	230	230	4·51	5 0	7·5	7 5	10·5	329	1·875	4	8	19	23	4·5	42	27	53	66
do. do. ....kilos.	154	104	104	230	254	381	381	533	149	95	203	406	978	1168	229	2134	1360	2692	3353
do. Projectile ....lbs.	1·5	1·5	6 oz.	3·3	3·3	3·3	6	6	6	11·75	12·5	12·5	12·5	14·33	14·33	31	31	45	45
do. do. ......kilos.	0·681	0·681	0·17	1·5	1·5	1·5	2·722	2·722	2·72	5·33	5·67	5·67	5·67	6·5	6·5	14·06	14·06	20·41	20·41
	oz.	oz.	oz.	oz.	oz.	lb. oz.	oz.	lb. oz.	oz	oz.	oz.	lb.	lb. oz.	lb.	ozs.	lb.	lb.	lb. oz.	lb.
do. Charge, M.D. Cordite	2¼	2¼	1¼	8·25	10·0	1 0	10	1 2·5	7¾	7·75	15	1·1	3 2¼	5·75	15	10·5	5·0	9 11	14
do. do. do. kilos.	0·071	0·071	0·042	0·234	0·283	0·453	0·283	0·525	0·22	0·22	0·369	0·5	1·43	2·608	0·425	4·76	2·27	4·395	6·35
Muzzle Velocity ....f.s.	2035	2000	2800	2132	2300	2680	1968	2400	1000	1100	1585	1640	2700	3050	1485	3000	2300	2600	3000
do. do. ......m.s.	620	609	853	650	701	817	600	731	305	335	483	500	823	930	452	914	701	792	914
Muzzle Energy ....f.t.	43	41·6	20·4	104	121	164	161	240	41·6	98	213	233	632	922	218	1934	1137	2109	2808
do. do. ....m.t.	13·3	12·8	6·3	32·2	37·5	50·8	49·8	74·3	12·8	30·3	66	72	196	285·5	67·5	599	352	653	869·6
Penetration at Muzzle ...ins.	3·5	3·4	3·6	5·15	5·8	7 3	5·4	7·3	1·95	..	..	5·1	10·8	13 7	..	17·4	11·6	15·6	19·3
(Tressider Wrought Iron Pl.)																			
do. do. ...mm.	88·9	86·3	91·4	130·8	147·3	185·4	137·2	185·4	49·5	..	..	129·5	274	348·0	..	442·0	294·6	396·2	490·2
Rounds per Minute	70	70	80	25	30	30	25	30	..	20	20	20	20	25	15	12	20	12	12

Diameter of Bore ....ins.	5	5·5	6	6	7·5	7·5	8	8	9·2	9·2	10	10	12†	12†	13·5	14†	15	15	16	18
do. do. ....mm.	127·2	139·7	152	152	190	190	203	203	234	234	254	254	305	305	343	355·6	381	381	406	457
Length of Bore ....cals.	45	50	45	50	45	50	45	50	45	50	45	50	45	50	45	45	40	45	45	40
	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
Weight of Gun	4·05	5·65	8·4	8·75	13·8	15·75	18·0	20·4	26·75	28·82	36·25	38·25	59·3	66·7	76	85	85	98·6	108	152
do. do. ....kilos.	4114	5740	8535	8890	14021	16003	18289	20727	27179	29289	36832	38864	60252	67770	77216	86364	86364	96118	109728	154440
do. Projectile ....lbs.	60	83	100	100	200	200	250	250	380	380	500	500	850	850	1250	1400	1920	1925	2130	3320
do. do. ......kilos.	27·2	37·6	45·36	45·36	90·72	90·72	113·4	113·4	172·37	172·37	226·8	226·8	385·55	385·55	567	635	871	873·2	966	1506
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
do. Charge, M.D. Cordite	16	25·0	31	33·0	74	76	80	90	122	136	167	200	260	285	296	324	380	400	580	690
do. do. do. kilos.	7·25	11·34	14·061	15·0	33·566	34·478	36·29	40·82	55·34	61·7	75·75	90·72	117·93	129·3	134·26	147	172·3	181	263	313
Muzzle Velocity ....f.s.	2700	2900	2800	3000	2900	3000	2845	3000	2750	3000	2800	3000	2800	3000	2700	2700	2362	2500	2630	2400
do. do. ....m.s.	823	884	853	914	884	914	867	914	838	914	853	914	853	914	823	823	720	762	801·6	731
Muzzle Energy ....f.t.	3032	4840	5436	6240	11663	12481	14031	15600	19926	23714	27181	31203	46208	53046	63187	70770	74275	83425	102160	132600
do. do. ....m.t.	939	1499	1683·4	1932	3611·9	3865·2	4345·2	4831·2	6171	7340	8418	9663	14310	16428	19568	21916	23002	25835	31670	41065
Penetration at Muzzle ...ins.	18·4	25·8	22·9	25·5	30·6	32·3	32·2	34·9	35·2	40·1	39·7	44·1	47·3	52·5	51·3	53·2	49·1	53·7	58	60
(Tressider Wrought Iron Pl.)																				
do. do. ...mm.	724	701·0	581·6	647·7	777·2	820·4	817·9	886·4	894·1	1018·5	1008·4	1120·1	1201·4	1333·5	1363·0	1351·3	1247	1364	1473	1524
Rounds per Minute	10	10	9	9	6	6	5	5	4	4	3	3	2	2	2	2	2	2	2	2

Corrected to September, 1923.

* This gun can be arranged for anti-torpedo boat attack also.

† These guns can be used on Railway Truck Mountings.

ELSWICK HOWITZER, FIELD AND TRENCH GUNS.

This Table is supplied by the Manufacturers.

	Mountain Gun.	Field.	Horse and Field.	Field.			Howitzers.				Field Position.	Howitzers.						Bomb Thrower	Trench Howtzr.	Trench Howtzr.	Stick Bomb Thrower	Anti-Aircraft.	Tank.
Diameter of Bore ... ins.	2·953	3	3	3·3	3·3	4	3·75	4·5	4	4·7	5	6	8	9·2	11	11·24	12	13·5	11	5	3·5	3	2·244
„ „ ... mm.	75	76	76	84	84	101·6	95·25	114·2	102	120	127	152	203	234	279·4	285·5	304·8	342·9	273·4	127	88·9	76·2	57
Length of Bore ... calibres	15·2	28	23	28	33	30	23	20	8·75	12	32	12·2	17	13·7	12	15	17.3	..	5	5·4	..	45	23
	lb.	cwt.	cwt.	cwt.	cwt.	tons	cwt.	cwt.	lb.	cwt.	tons	ton	tons	tons	tons	tons	tons.	lb.	lb.	lb.	lb.	cwt.	cwt.
Weight of Gun	260	7·25	6	9	9¼	1·09	11·25	14·75	220	8	2	1	2·9	4·3	5·5	7·85	10·5	973	1481	252	863	20	5
„ „ ... kilos.	118	368	305	457	483	1112	571	749	100	406	2032	1016	2950	4369	5588	7976	10,668	441	672	114	391	1016	254
„ Projectile lbs.	12·5	14·3	12·5	18·5	20¼	31	27·5	35	20	35	60	100	220	290	500	661·38	750	200	200	40	200	12·5	6
„ „ kilos.	5·67	6·49	5·67	8·39	9·3	14	12·5	15·87	9·07	15·87	27·22	45·36	100	131·5	227	300	340·2	90·7	90·7	18	90·7	5·6	2·722
	oz.	oz.	lb. oz.	lb. oz.	lb. oz.	lb.	lb. oz.	lb. oz.	oz.	lb. oz.	lb. oz.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	oz.	lb. oz.	lb. oz.	oz.
„ Charge M.D. Cordite	10	20¼	1 4	1 6	1 9	4·75	2 5¼	1 7	8¼	1 4¼	9 8	3	19·5	14	20	32	49	1¼	1	3½	2 10	2 10	8¼
„ „ „ kilos.	0·283	0·582	0·567	0·624	0·71	2·15	1·066	0·652	0·241	0·582	4·31	1·361	8·85	6·35	9·07	14·51	22·2	·6	454	·1	1·2	1·2	·248
Muzzle Velocity ... ... f.s.	1250	1755	1700	1635	1750	2000	1550	1450	950	1150	2150	1000	1550	1250	1220	1230	1470	380	400	429	355	2575	1580
do. do. ... m.s.	381	535	518	498	533	610	477·4	442	290	350	655	305	472·5	381	372	375	448	115·8	122	130·7	108·2	784·8	481·5
Muzzle Energy ....f.t.	..	..	..	..	..	..	...	..	..	..	..	..	..	..	..	..	11,238	200	222	51	174·7	574·7	103·9
do. do. ....m.t.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3480	61·9	68·7	15·8	54·1	178	32·2
Penetration at Muzzle ...ins. (Tressider Wrought Iron Pl.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16·9	..	..	..	..	10·1	3·9
do. do. mm.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	429·2	..	..	..	..	256·5	99
Rounds per Minute............	..	..	..	..	20	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	20	25

Corrected to September, 1923.

BEARDMORE GUNS.

This Table is supplied by the Manufacturers.

(September, 1923.)

Gun Calibre.	Length of Bore.	Weight of Gun.	Weight of Shot.	Muzzle Velocity.
inches.	calibres.	tons. cwts.	lbs.	ft.-secs.
16·0	45·0	107 0 (all steel)	2100	2675
15·0	45·0	96 0	1850	2600
13·5	46·0	77 0	1375	2620
12·0	50·0	66 0	950	2820
9·2	50·0	28 10	425	2810
8·0	55·0	18 5 (all steel)	250	3020
7·5	45·0	13 18	200	2800
6·0	50·0	7 18 (all steel)	100	2950
6·0	45·0	6 18	100	2800
5·5	55·0	5 18 (all steel)	82	3025
4·7	45·0	3 4	45	2750
4·0	50·0	2 3	31	3000
4·0	52·5	2 8	25	3200 (Anti-aircraft)
3·3	31·1	0 9 (all steel)	18·5	1760 (Field gun)
3·0	40·0	0 12 (all steel)	12·5	2250
2·24	23·2	0 5 (all steel)	6	1525 (Tank gun)
1·56	23·0	0 0·82 (all steel)	2	1525 (Anti-tank gun for Infantry)

FRENCH NAVAL ORDNANCE.

Date and Pattern of Gun.	Model 1913. (1)	Model 1906. (2)	Model 1902. (3)	Model 1893–96.				Model 1893.				
Desig. by Calibre, in cms.	34	30·5	30·5	30·5	27·44	24·0	19·4	34·0	30·5	27·44	24·0	19·4
Calibre, in inches	13·4	12·01	12·01	12·01	10·8	9·45	7·64	13·39	12·0	10·8	9·45	7·64
Total length, in feet	..	..	..	..	..	..	..	..	..	..	..	..
Length of Bore, in ins.	..	..	..	..	..	..	..	..	..	..	..	..
Length of Bore, in cals.	45	45	45	40	40	45	45	35	40	40	40	40
Total weight, in tons	66	45	..	44·4	34·5	23·6	12·5	52·9	45·9	34·9	22·4	10·6
Weight of Firing Charge, Armour-piercing Projectile . lb.	..	..	..	246	188·5	145½	74	243·0	198·4	114·6	110·2	44·1
Weight { Armour-piercing Projectile . lb.	1190	969	750	750	562	375	190	925·9	643·8	476·2	317·5	165·3
Weight { Common Shell . „	..	..	..	750	562	375	190	925·9	643·8	476·2	317·5	165·3
Muzzle Velocity, in f.-s., A.P. Projectile	..	2871	2870	2650	2650	2870	2870	2400	2625	2625	2625	2625
Muzzle Energy { Total, in f.-t.	65340	54343	42890	36782	27186	21445	10890	36850	30750	22750	15170	7898
Muzzle Energy { Per in. circ., f.-t.	..	..	..	..	..	..	..	..	815·8	670·7	511·1	329·1
Perforation at Muzzle,† wrought iron, inches	..	..	46·0	42·7	38·8	37·0	29·0	36·8	37·3	33·7	29·4	23·4
Perforation Krupp Steel, 3000 yds.	11·8 (9000 mètres)	..	15½	13½	11½	10½	6¾	11½	11	9	7½	5½

† By Tressider's formula.

In the new cruisers a 15-cm. gun of a new pattern is to be mounted.

(1) Bretagne class. (2) Jean Bart class. (3) Voltaire class. The secondary armament of the Bretagne and Jean Bart classes is a 55-cal. 5·5-in gun.

UNITED STATES NAVAL ORDNANCE.

GUN.	MARK.	Length in Calibres.	Total Length.	Capacity of Chamber in Cubic Inches.	Travel of Projectile in Inches.	Weight of Gun.	Weight of Projectile.	Weight of Charge.	Muzzle Velocity.	Muzzle Energy.	Penetration at Muzzle, Krupp Armour, using Capped Projectile.	At 3000 Yards.		At 6000 Yards.		At 9000 Yards.	
												Remaining Velocity.	Penetration.	Remaining Velocity.	Penetration.	Remaining Velocity.	Penetration.
			inch.			tons.	lb.	lb.	ft.-seconds.	ft.-tons.	inch.	ft.-seconds.	inch.	ft.-seconds.	inch.	ft.-seconds.	inch.
3-in. S.A.	V., VI.†	50	159	219	128·3	1·0	13	3·85	2700	658	3·3	1230	1·2	848	0·8	..	..
4-in. R.F.G.	III., IV., V., VI.	40	164	331	134·5	1·5	33	4·85	2000	915	3·4	1156	1·7	897	1·2	..	..
4-in. R.F.G.	VII.	50	205	652	168·3	2·6	33	9·0	2500	1,430	4·6	1432	2·2	979	1·4	853	1·2
4-in. R.F.G.	VIII.‡	50	205	652	168·3	2·9	33	12·3	2800	1,794	5·3	1627	2·6	1033	1·5	878	1·2
5-in. R.F.G.	II., III., IV.	40	206	656	165·8	3·1	50	10·0	2300	1,852	5·3	1286	2·6	934	1·7	829	1·4
5-in. B.L.R.	V., VI.	50	256	1,200	215·6	4·6	60	19·2	2700	3,032	6·2	1692	3·5	1102	2·0	928	1·6
5-in. B.L.R.	VI.	50	256	1,200	215·6	4·6	50[1]	20·5	3000	3,122	6·4	1732	3·2	1057	1·7	877	1·4
5-in. R.F.G.	VII.§	51	261	1,135	215·6	5·0	50	23·8	3150	3,439	6·8	1835	3·4	1091	1·8	895	1·4
6-in. R.F.G.	II., III.	30	196	1,287	150·0	4·8	105	18·8	1950	2,768	5·3	1305	3·2	1009	2·3	909	2·0
6-in. R.F.G.	IV., VII.	40	256	1,320	205·8	6·0	105	18·8	2150	3,365	6·0	1440	3·6	1058	2·4	934	2·1
6-in. R.F.G.	IX.	45	270	1,320	221·7	7·0	105	18·8	2250	3,685	6·3	1511	3·8	1086	2·5	948	2·1
6-in. B.L.R.	VI.	50	300	2,101	247·5	8·3	105	30·0	2600	4,920	8·6	1770	4·7	1207	2·9	996	2·2
6-in. B.L.R.	VIII.	50	300	2,101	247·5	8·6	105	37·0	2800	5,707	11·3	1923	5·2	1297	3·2	1026	2·3
7-in. B.L.R.	II.	45	323	3,643	259·8	12·7	165	58·0	2700	8,338	9·6	1948	6·4	1382	4·2	1083	3·0
8-in. B.L.R.	III., IV.	35	305	3,170	245·8	13·1	260	43·8	2100	7,948	8·6	1576	6·0	1206	4·2	1040	3·6
8-in. B.L.R.	V. and VI.	45	369	5,243	299·1	18·7	260	98·5	2750	13,360	12·0	2106	8·6	1589	6·1	1227	4·4
10-in. B.L.R.	I., II.	30	329	6,779	251·1	25·1	510	90·0	2000	14,141	10·7	1590	8·0	1274	6·1	1103	5·0
10-in. B.L.R.	III.	40	413	10,222	327·0	34·6	510	207·5	2700	25,772	19·4	2184	11·9	1747	9·0	1406	6·9
12-in. B.L.R.	I., II.	35	441	11,991	345·2	45·3	870	160·0	2100	26,596	14·2	1733	11·2	1433	8·8	1219	7·2
12-in. B.L.R.	III., IV.	40	493	17,096	392·2	52·1	870	237·5	2400	34,738	19·8	1994	13·3	1649	10·5	1376	8·3
12-in. B.L.R.	III., IV.	40	493	17,096	392·2	52·1	870	305·0	2600	40,768	18·5	2171	14·8	1801	11·7	1500	9·3
12-in. B.L.R.	V.	45	553	16,974	452·0	52·9	870	305·0	2700	43,964	19·4	2259	15·5	1877	12·3	1561	9·8
12-in. B.L.R.	VI.	45	553	14,970	452·0	53·6	870	340·0	2850	48,984	20·8	2393	16·6	1991	13·3	1653	10·6
12-in. B.L.R.	VII.	50	607	14,296	506·3	56·1	870	340·0	2950	52,483	25·7	2483	17·5	2071	13·9	1719	11·0
13-in. B.L.R.	I., II.	35	479	15,068	374·9	61·4	1130	180·0	2000	31,333	15·0	1679	12·0	1414	9·7	1221	8·1
14-in. B.L.R.	I.[1]	45	642	..	..	63·6	1400	365·0	2600	65,606	39·7*	..	23·4*	..	..	..	..
14-in. B.L.R.	II.[2]	50	700	..	..	82·2	1400	..	2800	76,180	44·1	..	27·4	..	..	..	..

[1] Pennsylvania class.

[2] New Mexico class.

For the 15-in. and 16-in. guns see the Bethlehem table, page 536.

* De Marre formula.

† A short anti-aircraft 3-in. gun is mounted in many of the ships.

‡ There is now a 4-in. 50-cal. anti-aircraft gun.

§ All battleships from the Delaware class onward have this gun for torpedo defence.

Corrected to 1923.

BETHLEHEM STEEL CO.

SHIP AND COAST-DEFENCE GUNS.

Table supplied by the Manufacturers, August, 1923.

Calibre.		Length of bore.	Weight of gun, including breech mechanism.		Weight of projectile.		At Muzzle.						Type of Ammunition.
							Velocity.		Energy.		Penetration of steel-plate (De Marre).		
inches.	millimetres.	calibres.	lbs.	kgs.	lbs.	kgs.	ft. per sec.	metres per sec.	foot-tons.	metre-tons.	inches.	milli-metres.	
1·457	37	about 50	160	72·5	1·07	0·48	2,150	655	34	10·5	2·04	51·8	Fixed in cartridge case.
1·850	47	50	550	249·5	3·3	1·5	2,400	732	132	41	4·11	104·4	,, ,,
2·244	57	50	960	435·5	6·07	2·75	2,400	732	243	75	5·17	131·3	,, ,,
3	76	50	1950	884·5	13	5·9	2,700	823	658	204	7·71	195·8	,, ,,
			tons.										
4	102	50	2·6	2,642	33	15	2,800	853	1,795	557	11·61	294·9	,, ,,
4	102	50	2·6	2,642	30·86	14	3,000	914	1,928	597	12·22	310·4	,, ,,
5	127	51	5·0	5,080	50	22·7	3,150	960	3,440	1,067	14·56	369·8	Separate, with powder in bag.
6	152	45	7·0	7,112	105	47·6	2,600	792	4,926	1,523	15·47	392·9	Separate, with cartridge case.
6	152	50	8·4	8,534	105	47·6	2,800	853	5,713	1,767	17·19	436·6	Separate, with powder in bag.
6	152	53	10·1	10,260	105	47·6	3,000	914	6,559	2,028	18·97	481·8	,, ,, ,,
7	178	45	12·7	12,900	165	74·8	2,700	823	8,348	2,584	19·11	485·4	,, ,, ,,
7	178	50	14·5	14,730	165	74·8	2,900	884	9,631	2,982	21·16	537·5	,, ,, ,,
8	203	45	18·6	18,900	260	118	2,800	853	14,148	4,379	24·15	613·4	,, ,, ,,
8	203	50	22·3	22,660	260	118	2,900	884	15,177	4,703	25·38	644·6	,, ,, ,,
9·2	234	50	30·4	30,890	380	172	2,900	884	22,181	6,856	28·66	727·9	,, ,, ,,
10	254	45	35·4	35,970	515	234	2,800	853	28,023	8,685	30·97	786·6	,, ,, ,,
10	254	50	43·9	44,600	515	234	2,900	884	30,061	9,327	32·56	827·0	,, ,, ,,
12	305	45	53·8	54,660	870	395	2,800	853	47,341	14,660	37·05	941·1	,, ,, ,,
12	305	50	57·5	58,400	870	395	2,900	884	50,783	15,745	38·95	989·3	,, ,, ,,
14	356	45	64·6	65,650	1,400	635	2,600	792	65,687	20,317	39·69	1008·0	,, ,, ,,
14	356	50	79·4	80,700	1,400	635	2,800	853	76,181	23,567	44·12	1121	,, ,, ,,
15	381	45	86·5	87,880	1,700	771	2,600	792	79,763	24,668	42·35	1076	,, ,, ,,
16	406	45	105·0	106,500	2,100	953	2,600	792	98,530	30,491	45·95	1167	,, ,, ,,
16	406	50	128·0	130,200	2,100	953	2,800	853	114,272	35,369	51·08	1297	,, ,, ,,
16	406	50	140·0	142,400	2,330	1,057	2,700	823	117,900	36,500	52·39	1331	,, ,, ,,
18	457	45	150·0	152,400	3,330	1,510	2,450	747	138,734	42,979	51·71	1313	,, ,, ,,

Guns of 4·7-in. calibre and under, equipped with the wedge-type breech mechanism, are supplied with an automatic breech-opening device, if desired.

GERMAN SHIP AND COAST GUNS.

This list of Krupp guns was corrected in September, 1921. It is preserved here as a record of the guns which were produced at Essen shortly before the war, and during its course up to the time when the provisions of the Armistice came into force. Under the Peace Treaty the delivery of German war material abroad is interdicted. The most important of the new guns were those of heavy calibres: 16 in., 18 in. and 20 in. The pre-war table showed no guns of greater length than 40 calibres below the 11 in. The Essen Company always attached the greatest importance to the endurance and performances of its heavy guns. The light cruiser Dresden, which has been laid down at Wilhelmshaven, will have 6-in. or 5·9-in. guns.

Calibre	cm.	7·5 = 2·9 in.		8·8 = 3·4 in.		10·5 = 4·1 in.		15 = 5·9 in.		21 = 8·2 in.		24 = 9·4 in.		28 = 11 in.	
Length of Bore	cals.	45	50	45	50	45	50	45	50	45	50	45	50	45	50
Length of Bore	mm.	3375	3750	3960	4400	4725	5250	6710	7455	9420	10465	10800	12000	12600	14000
Total Length	,,	3570	3945	4190	4630	5000	5525	7100	7845	9965	11010	11425	12625	13330	14730
Weight of Gun	kg.	760	780	1225	1260	2095	2140	5970	6120	14600	15440	21950	23250	34900	36900
Weight of Projectile . .	,,	5·8	5·8	9·5	9·5	16	16	46	46	125	125	190	190	300	300
Weight of Charge . . .	,,	1·84	1·84	2·97	2·97	5·05	5·05	14·4	14·4	38·8	38·8	58·3	58·3	92·7	92·7
Muzzle Velocity . . .	m/sec.	850	875	850	875	850	875	850	875	850	875	850	875	850	875
Muzzle Energy	mt.	213·5	226·5	350	371	590	625	1694	1797	4610	4880	7000	7420	11040	11700
Muzzle Penetration (Steel)	mm.	206	215	247	258	297	310	433	452	616	642	717	747	842	878

Calibre	cm.	30·5 = 12 in.		35·56 = 14 in.		38·1 = 15 in.		40·64 = 16 in.		45·72 = 18 in.		50·8 = 20 in.	
Length of Bore	cals.	45	50	45	50	45	50	45	50	44	50	45	50
Length of Bore	mm.	13725	15250	16000	17780	17145	19050	18290	20320	20575	22860	22860	25400
Total Length	,,	14520	16045	16925	18705	18135	20040	19345	21375	21765	24050	24180	26720
Weight of Gun	kg.	45100	47700	70000	75200	86100	92500	104300	112200	148300	159500	204000	219000
Weight of Projectile . . .	,,	390	390	620	620	760	760	920	920	1310	1310	1805	1805
Weight of Charge . . .	,,	120	120	190	190	233	233	284	284	402	402	553	553
Muzzle Velocity	m/sec.	850	875	850	875	850	875	850	875	850	875	850	875
Muzzle Energy	mt.	14350	15230	22800	24200	27950	29650	33900	35950	48250	51200	66500	70500
Muzzle Penetration (Steel).	mm.	927	967	1095	1142	1177	1227	1259	1312	1428	1488	1600	1668

SIZE AND FIGHTING QUALITIES OF BRITISH BATTLESHIPS OF DIFFERENT PERIODS.

Name.	Date of Completion.	Displacement.	Side Armour.	Speed.	Total Weight of Shot in One Round.	Collective Energy at Muzzle of One Round
		tons.	in.	knots.	lb.	foot-tons.
Warrior	1861	9,210	4½-in. wrought-iron	14½	3,800	61,476
Hercules.	1868	8,680	9-in. to 6-in. wrought-iron	14	5,400	70,200
Alexandra	1877	9,490	12-in. to 6-in. wrought-iron	15	5,426	71,400
Inflexible	1881	11,880	24-in. to 16-in. wrought-iron	13	6,936	123,120
Benbow	1888	10,600	18-in. compound	16·75	4,600	135,560
Royal Sovereign	1892	14,150	18-in. and 5 in. compound	17·5	5,800	159,610
Barfleur	1894	10,500	12-in. compound	18·5	2,450	67,670
Canopus	1900	12,950	6-in. hardened steel	18·25	4,600	178,720
Prince of Wales	1902	15,000	9-in. super-hardened steel	18·25	4,600	194,400
King Edward VII.	1905	16,350	9-in. hardened steel	19	6,100	271,800
Dreadnought	1906	17,900	11-in. hardened steel	21	8,800	487,100
Neptune	1911	20,600	12-in. hardened steel	21·5	8,900	545,000
Ajax	1913	25,000	12-in. hardened steel	21·5	14,500	625,000
Queen Elizabeth	1914	27,500	13-in. hardened steel	25	{ about 16,400 }	710,000

PARTICULARS OF SUCCESSIVE LARGE BRITISH NAVAL GUNS, 1800 TO 1921.

Year.	Type.	Weight.		Length.	Calibre.	Weight of Projectile.	Weight of Charge.	Muzzle Energy.	Penetration of Wrought-iron at 1000 yards range.
		tons.	cwt.	in.	in.	lb.	lb.	ft.-tons.	in.
1800	Cast-iron smooth-bore . .	2	12	114	6·4	32	10	400	—
1842	Ditto	4	15	—	8·12	68	16	700	—
1865	Woolwich wrought-iron .	4	10	—	7	115	22	1,400	7
1870	Built-up muzzle-loader . .	38	0	200	12·50	810	200	13,900	17
1880	Ditto	80	0	321	16	1700	450	27,960	22½
1887	Built-up breech-loader . .	110	10	524	16·25	1800	960	54,390	32
1895	Wire-wound breech-loader .	46	0	445·5	12	850	—	33,940	34·6
1900	Ditto	51	0	496·5	12	850	210	36,290	35·4
1905	Ditto	58	0	558	12	850	—	47,700	46·2
1912	Ditto	76	0	626	13·5	1400	—	60,600	*50
1914 to 1920	Ditto	97	0	675	15	1900	—	82,300	*56
1921	Ditto	117	0	720	16	2240	—	93,230	*57

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* At muzzle. Guns of 18-in. calibre were fitted to one cruiser during the War, but were subsequently removed and used in monitors.

NAVAL REFERENCE SECTION.

FIRST LORD'S STATEMENT EXPLANATORY OF THE NAVY ESTIMATES, 1923-24.

In their main outlines the Navy Estimates for 1923-24 bring out the full effect of the programme of reductions initiated immediately upon the acceptance by His Majesty's Government of the Washington Agreement. The ratification of the Agreement has not yet been completed by all the great Powers concerned, and none of them have so far followed the example of this country, which, in anticipation of the general ratification and implementing of the Treaty, has already sold or broken up practically all the Capital Ships to be scrapped under the Treaty. This act of faith, though involving risks to which the Board of Admiralty have been fully alive, has secured for the taxpayer the immediate fruition of large economies which would otherwise have been deferred.

The full extent of these economies is made clear by a comparison between the new Estimates and those for 1921-22. Part of this great difference, it is true, is accounted for by the fall in wages and prices, by the progressive elimination of a variety of charges incidental to the winding up of war accounts and to the general aftermath of war, and by an increasingly rigid scrutiny of expenditure in every department. But it is necessary to remember that, to a very great extent, these detailed administrative economies, effected by the reduction of reserves and the postponement of all but the most indispensable new requirements, are themselves only made possible, even in the present financial stringency, by the general easing off of naval competition which, it is hoped, will result from the Washington Agreement.

The gross Estimates amount to £61,401,165, as compared with £69,476,657 for 1922-23, and £92,519,869 for 1921-22, a reduction of £31,118,704, or 33⅓ per cent. over the two years. The net Estimates amount to £58,000,000 as compared with £64,883,700 and £83,444,000 respectively, a corresponding reduction of £25,444,000, or 30 per cent. over the same period.

The total of the *effective* Naval Votes is £50,102,100 as compared with £54,719,400 for 1922-23, and £76,553,300 for 1921-22, and of the *non-effective* Votes £7,897,900 as compared with £10,164,300 and £6,890,700 respectively. The total of the *non-effective* Votes for 1922-23 was, of course, abnormally swollen, to the extent of £3,000,000, by the special immediate provision necessitated by the reduction of personnel, but the more enduring effect of that reduction, in large additions to the retired pay and pension lists, is reflected in an increase in the present Estimates of one million over the figures for 1921-22. The additional expenditure necessitated by the laying down at the end of 1922 of two new Capital Ships, the battleships Nelson and Rodney, has to a very considerable extent neutralised and obscured the very substantial reductions made in the *effective* Votes. On these, the first Capital Ships to be laid down since 1916, and the last which, under the Washington Agreement, can be laid down before 1931, we expect to spend in 1923–24, upwards of £4,000,000. This includes their armament and maintenance stores.

The reduction of the total of the *effective* Votes by £4,617,300, in spite of this heavy additional liability, has only been made possible by the most rigid administrative economy. Schemes involving capital outlay have been postponed, even though they would ultimately make for economy. Reserves of stores, though required for war purposes, are being obtained gradually, completion to full requirements being spread over a number of years. The continuance of this policy can only be justified by the seriousness of the financial situation and by the expectation of a general atmosphere of tranquillity in the sphere of naval armaments.

We do not propose to lay down any new ships in 1923–24, but a small sum has been taken for preparatory work on a submarine, construction of which we hope to begin in 1924–25.

The Dockyard discharges forecasted in my predecessor's statement last year have been carried out and the reductions contemplated in other directions have been effected. As part, however, of the Government's scheme for the relief of unemployment during the winter months, savings on current Navy Estimates to the amount of £400,000 have been used to accelerate certain work which otherwise would have had to be done in future years.

The reduction of the personnel of the Fleet by 20,000 officers and men, which was foreshadowed in my predecessor's statement, is expected to be complete by April 1, except for 140 officers and 1,000 men who are being retained pending the final decision of the Government on the Admiralty proposal that the Navy shall in future provide the personnel for its own Air arm.

No aspect of the inevitable task of retrenchment has been more distressing than that which has involved the severance of thousands of officers and men of distinguished record or fine promise from the Service to which they were whole-heartedly devoted. In the sacrifice which they have had to make to the exigencies of the Nation they have a claim, not only for the measure of compensation—in itself not ungenerous—which they have received from the State, but upon the active and helpful goodwill of their fellow-citizens here and in every part of the Empire.

ADMIRALTY, L. S. AMERY.
February 27, 1923.

MEMORANDUM.

(Supplemental to the Explanatory Statement.)

The Estimates for 1923-24 compare with those for 1922-23 as follows:—

	Gross.	Net.
1922–23	£69,476,657	£64,883,700
1923–24	£61,401,165	£58,000,000
Reduction . .	£8,075,492	£6,883,700

STRENGTH AND DISTRIBUTION OF THE FLEET.

The strength and distribution of the main fleets remain approximately as they were at the commencement of the financial year 1922–23.

During the year, however, the actual strength of the Navy has undergone sensible reduction through the carrying out of the terms of the Washington Treaty, and selling or breaking up, with the solitary exception of the Lion, of all the Capital Ships designated for scrapping.

MEDITERRANEAN.

A strengthening of the Fleet in Mediterranean waters has been temporarily necessitated by the Near Eastern crisis and may become desirable, as a permanent measure in the future, to meet the general strategic situation.

Since October last, in addition to the Mediterranean Squadron proper, two battleships, a light cruiser squadron, and two flotillas of destroyers have been stationed in the waters of the Dardanelles and Sea of Marmora.

The political value of the Naval Forces employed in the Mediterranean during the recent protracted negotiations with Turkey needs little emphasis. At a critical period of those negotiations they played a considerable part in the maintenance of peace.

From the Service point of view it is desirable to emphasise the closeness and cordiality of the co-operation between the Services which has materially enhanced the effectiveness of the force available to support British policy.

GENERAL NAVAL ACTIVITIES.

The very successful visit of the battle cruisers Hood and Repulse to Brazil has again demonstrated the peace value of the British Navy politically and commercially. The withdrawal of the South American Squadron, due to financial reasons, has undoubtedly been detrimental to our general interests in South America, and it is the earnest hope of the Admiralty that it will be possible either to re-instate this Squadron or to arrange for frequent visits to South American waters in the near future.

On the outbreak of the recent trouble at the Baltic port of Memel, the light cruiser Caledon was dispatched to the spot and remained there during the most critical period—a typical instance of the varied work of the Navy under peace conditions.

The severity of weather conditions has necessitated the temporary discontinuance of the sloop patrol for the protection of the Murmansk fishery till the end of March. It is hoped to provide for the effective maintenance of this patrol through the winter months in future.

There has been some recrudescence of slave-running in the Red Sea and Persian Gulf, and H.M. ships have been actively engaged in endeavouring to suppress it. As a result of their efforts, two dhows engaged in this traffic have been captured and thirty-three slaves released.

IRELAND.

During the transition period in Ireland, vessels of H.M. Navy have carried out an active patrol in Irish waters for the prevention of arms traffic, etc., in co-operation, first with the Army, and later with the Irish Free State authorities.

The naval bases at Kingstown and Queenstown have been closed, and the Haulbowline Dockyard is being transferred to the Irish Free State

GERMAN PEACE TREATY.

The execution of the naval terms of the Treaty of Peace with Germany is now practically complete, and very substantial reductions have been made in the Allied Commission which was supervising this work.

The breaking up of the warships which were surrendered by Germany under the Peace Treaty is also nearly complete, and the Allied Commission which was supervising that work has been dissolved.

SINGAPORE.

Owing to the increased draught and size of modern battleships, it is no longer possible to dock the latest ships in Eastern waters. Any extension at Hong Kong is precluded by the terms of the Washington Agreement, and it has accordingly been decided to proceed gradually with the development of the naval base at Singapore. A total of £200,000 has been included in this year's Estimates for this purpose.

WEI-HAI-WEI.

As a measure of retrenchment the Dockyard has been closed. In accordance with the policy decided upon at the Washington Conference, negotiations are proceeding for the return of Wei-Hai-Wei to China. When these are completed, Wei-Hai-Wei will be used for the Navy only for health purposes.

ASCENSION.

In pursuance of the policy of retrenchment, as it is no longer necessary to retain Ascension for strategical purposes, the Island, which has been administered by the Admiralty for over 100 years practically as if it had been one of His Majesty's ships, has been annexed to St. Helena under the Colonial Office.

NAVAL STAFF.

The organisation of the Naval Staff on the lines laid down in 1920, and explained to Parliament in the Memorandum accompanying the First Lord's Statement on the Naval Estimates of that year, has been proceeded with.

It is an organisation, which it must be emphasised is the result of war experience, and is an essential instrument for Naval efficiency and security in the future. Any departure from its general principles would be fraught with grave danger.

The actual numerical strength and grouping of the Staff has, however, been exhaustively reviewed by the Board before the commencement of each financial year, with a view to effecting the utmost economy consistent with the requirements of Naval Policy. As a result of the modifications so carried out, the numbers of the Naval Staff now stand at 60 as compared with 87 in 1921, 118 in 1920, 160 in 1919, and 336 in 1918.

Gradually a body of officers with full war staff qualifications, after undergoing one year's training at the Naval Staff College at Greenwich, are becoming available. These officers are already filling positions both at the Admiralty and at sea.

It is recognised, however, that if the utmost value is to be obtained from this war staff training, it is desirable that there should be the closest co-operation with the Military Staff College at Camberley. This will only be possible to the fullest extent if Naval and Military Staff Colleges are in proximity to each other. Financial considerations, unfortunately, do not at the moment permit of moving the Naval Staff College to Camberley, but it will be desirable to do this so soon as the favourable opportunity arises.

PERSONNEL OF THE FLEET.

The reduction of 20,000 officers and men has been completed during the financial year now drawing to a close. But the numbers to be voted (99,500) are slightly in excess of the figure to which it was intended that they should fall by April 1, 1923, owing to the fact that it has been necessary to retain 140 officers and 1,000 men in anticipation of a decision of His Majesty's Government empowering the Admiralty to man with Naval personnel the Air Arm of the Fleet. This is at present manned, except for some of the observer officers, by personnel of the Royal Air Force.

SPECIAL REDUCTION SCHEME.

A special scheme of retirement for officers and of pensions and bonuses to surplus men taking their discharge was brought into force in May 1922. Retirement under this special scheme was made voluntary in the first place, apart from the retirement of certain officers specially promoted from Warrant rank, and a reduction of the age of compulsory retirement in certain of the Warrant Officer branches.

It was from the first anticipated, however, that the number of voluntary retirements would not be enough to clear the lists, and provision was made in the scheme for the selection of officers for retirement, if necessary. In the case of the Warrant Officer branches, the number of applications to retire largely exceeded the number of officers to be reduced and the lists were closed long before the period of six months allowed for the voluntary part of the scheme had expired. The number of voluntary retirements in the Engineering and Accountant branches and in the Royal Marines was very nearly sufficient to clear the lists, although it was necessary to select a few Engineer Commanders, Paymaster-Lieutenants, Lieut. Colonels and Majors, Royal Marines, for retirement; but in the Executive Branch, where the surplus was particularly large, it has been necessary to select about 600 officers for retirement under the scheme. The carrying out of this selection has thrown a most difficult and painful task upon the Board of Admiralty, who have been confronted with the necessity—a necessity which no degree of care in scrutinising individual records could wholly avoid—of retiring many officers who have rendered excellent service during the war, and whose retention would have been of very great value to the Service, could it have been justified by the size of the post-Washington Fleet.

By March 31 next, when the scheme finally closes, it is anticipated that roughly 2,000 officers will have retired under it.

Under the corresponding scheme for ratings some 11,500 men took their discharge voluntarily, but it has recently become apparent that the voluntary system would not bring about the full number of discharges required, and in February 1923 it was found to be necessary to issue notices of compulsory discharge to a further 800 men. Recruiting was also entirely suspended for some months, and is now in operation on a very restricted scale.

The economy resulting from these reductions is very evident in the Effective Votes for 1923-24.

SUPPLY BRANCH.

Consequent on the introduction of Central Storekeeping, by which the Accountant Officer is made responsible for the charge of all Naval and Victualling Stores in H.M. ships and establishments, it was decided to institute a Supply Branch consisting in the first instance of members of the former Victualling Branch, supplemented by volunteers from other branches with experience of Storekeeping. The system enables considerable savings to be made by avoiding the duplication of stores formerly in the charge of separate officers, and by reduction of stocks, and also reduces the number of separate store accounts. It also simplifies the issue of stores from Dockyards.

COAST GUARD.

The Coast Guard is being reconstituted undert he Board of Trade. It will continue to perform what has been during recent years of peace its main function, viz. the watching of the coast for wrecks and the working of rocket life-saving apparatus.

For purely Naval services, such as the manning of Naval Wireless Stations in the British Isles, upon which the Coast Guard have hitherto been employed, provision is now made out of the total of Fleet numbers.

Vote 1 (*Pay of the Fleet*).

Vote 2 (*Victualling and Clothing*).

Vote 3 (*Medical*).

Vote 4 (*Civilians employed on Fleet Services*).

Reduction on the 4 Votes—£2,861,000.

The effect of the reduction in Naval personnel is felt directly in the first three Votes. The average numbers to be provided for, exclusive of Coast Guard and Marine Police, are reduced from 108,500 to 99,000.

The cost of the Coast Guard, as already explained, no longer falls upon the net totals of the several Votes affected.

The further fall in the cost of living, with reductions in wages and prices, has also helped to lessen expenditure.

The policy of sharing shore hospital accommodation with the other Fighting Services, which was referred to in last year's statement, has been adopted with much success at Chatham Naval Hospital, where Military patients are being treated, while Naval patients are being treated at Military Hospitals to an increased extent. It has thus been possible to close Gibraltar Naval Hospital.

Economies have been effected as the result of the further labours of the Committee upon the employment of civilians on Fleet Services of which mention was made last year.

Vote 5 (*Education*).

Reduction—£58,000.

The reduction is mainly due to the termination of the courses at Cambridge, but some further administrative economies have been found possible at Dartmouth and elsewhere.

The short course of training at Cambridge University for officers who suffered loss of training in consequence of the war, comes to an end in March, 1923. The Admiralty are greatly indebted to the University and College authorities for the invaluable help and co-operation they have given in establishing and arranging these courses, and are not without hope that it may be possible to maintain, in some form or other, the close association of the Royal Navy with Cambridge, to which these courses have given rise.

The extension of the shore courses of Junior Officers referred to in my predecessor's statement on the Estimates of 1921-22 has now been effected, and all Acting

Sub-Lieutenants now undergo a six months' course of general and theoretical instruction at the Royal Naval College, Greenwich, which is followed by a further six months' instruction in the Gunnery, Torpedo, and Pilotage Schools.

The new arrangements for training officers of the Engineer Branch of the Royal Navy, to which reference is made also in the statement on the Estimates of 1921–22, came into force in May last. The course will include instruction in Electrical Engineering as well as in Marine Engineering, and will last four years, of which three years and eight months will be spent at the Royal Naval Engineering College, Keyham, and the remaining four months in the Torpedo School at Portsmouth. The Admiralty are fully confident that the four years' course, which corresponds in length to the Engineering courses outside the Royal Navy, will turn out a highly trained Officer, fully able to uphold the high traditions of this Branch of the Navy.

Vocational Training.—The Admiralty have, for some time past, had under consideration the desirability of making some provision for the vocational training of men of the Royal Navy and Royal Marines so that they may be better equipped for civil life on discharge from the active service. A beginning is being made in 1923-24 by providing a small sum of £2,500 in the Estimates for the provision of tools and technical literature and possibly also for part payment of fees to Technical Colleges. In future years more substantial provisions for this purpose will, it is hoped, be possible.

Employment of Ex-Service Men.—It is necessary not only to endeavour to fit the men for civil employment when they leave the Service, but also to try and bring them after discharge into touch with employers of labour. The reconstitution of the National Association for the Employment of Regular Soldiers as the National Association for the Employment of Regular Sailors, Soldiers and Airmen will, it is believed, go some way towards meeting the needs of the men in this direction.

Vote 6 (*Scientific Services*).

Reduction—£10,700.

The increased provision for scientific research and maintenance of research establishments and laboratories is due to the transfer of the cost of Chemical Warfare Research (£76,000) from Vote 9. Apart from this the provision is materially smaller, due to the reduction in the cost of special research and the maintenance of research establishments. The *gross* estimate is also increased by the fact that the cost of investigations carried out at all Naval establishments on behalf of the Department of Scientific and Industrial Research is now borne on the Research Vote, but this sum is recovered in the credit Subhead 6. Q.

The Vote has, on the other hand, been eased by the transfer of the charge of printing Admiralty Charts to the Stationery Office Vote in consequence of the establishment of a Government Chart Factory at Cricklewood. The preparation of the Charts remains, of course, the responsibility of the Admiralty.

The greater part of this Vote is now devoted to research and experiment, the importance of which is one of the outstanding lessons of the war. The number of scientific problems which require to be investigated is very great and continually increasing, but with the present limited scientific staffs only the most urgent of these problems can be investigated. A scheme for the pooling of all scientific staffs employed by the Admiralty is being worked out whereby it is hoped to meet requirements with the absolute minimum staff.

Vote 7 (*Reserves*).

Increase—£29,500.

The Vote for 1922-23 was abnormally reduced by the special exemption of certain classes of reserves from annual drill. This could not, of course, continue indefinitely, and the resumption in 1923-24 of these drills, particularly for the Royal Fleet Reserve, is responsible for the increase of expenditure.

Vote 8, *Section I.* (*Dockyard Personnel*).

Reduction—£986,100.

The reduction in the Dockyard numbers which was foreshadowed last year, has now been carried out, and it is not anticipated that further discharges will be necessary. It will be appreciated that a period of reductions and general uncertainty is not conducive to good work, and it is satisfactory to record that the return to normal conditions is showing itself in particular in the larger output which is now maintained by the men.

Certain additional numbers have been taken on temporarily during the winter months for the purpose of relieving unemployment at its acutest stage.

The reductions in wages in corresponding trades in the industrial world, accompanying the decreased cost of living, have been followed in the main at the Dockyards.

As regards the work of the Yards, it is anticipated that the Submarine now building will be completed during the year, and progress will be made with other new construction and reconstruction as well as with the normal programme of refits and repairs.

The Victory has now been placed permanently in No. 2 Dock at Portsmouth, and the work of building a cradle to support her is in hand, together with such other work as is absolutely necessary for her safety. It is to be regretted that public funds are not available for her complete restoration, but the immediate practical needs of the Navy must come first. There is, however, every reason to hope that the response of the nation to the "Save the 'Victory' Fund" appeal may enable this glorious old ship to be restored to the state in which she fought at Trafalgar.

Vote 8, *Section II.* (*Store Sub-heads*).

Reduction – £930,500.

The lower estimate is due to reduction in expenditure of £1,395,000, and would have been still lower were it not inevitable that there must be a fall, estimated at £500,000, in the receipts from sales of surplus and obsolete warships, etc. The decrease in expenditure is in part due to lower prices, but has been largely achieved by reduction in the requirements for Dockyard work, and in requirements of sea stores for the Fleet. The latter has been made possible by administrative reorganisation on board H.M. ships.

Vote 8/II/*K.* (*Fleet Fuelling*).

Reduction—£345,000.

The allowance of fuel for the steaming of the Fleet has again been cut down to a very low limit.

Following also on the policy enunciated last year several of the Royal Fleet Auxiliaries normally employed on Fleet fuelling work remain laid up, and the inconvenience resulting from this restriction of fuelling facilities has still to be accepted.

Further, although the Board of Admiralty regard the building up of adequate reserves of oil fuel in this country and at fuel bases abroad as a matter of vital importance, they have accepted for the coming year a slower rate of progression than they would have felt justified in recommending at a time of less acute financial stringency.

Vote 8, *Section III.* (*Contract Shipbuilding*).

Increase, £1,696,950.

The increase is due to the larger provision necessary in 1923-24 on account of the two new battleships. The provision under Vote 8, Section III., for these ships in 1922-23 was £300,000, and in 1923–24 is £2,914,160. The increase of £2,614,160 on account of these ships is partly set off by reductions in other directions as a result of a rigid scrutiny of requirements.

Vote 9 (*Naval Armaments*).

Increase—£280,400.

This Vote bears to the extent of £670,000 the increase in expenditure due to the construction of the new battleships. Apart from this, a material decrease would have been possible, due mainly to the fall in costs and to the reduction in war liabilities, but also to the transfer of the cost of Chemical Warfare Research to Vote 6.

The transfer to the new Marine Police of the duties of Metropolitan Police at various establishments referred to in last year's statement will be effected during the year 1923-24.

Vote 10 (*Works*).

Reduction, £440,150.

So very large a reduction was made in the Vote for 1922-23, that further large reductions were not to be anticipated.

The annuity under the Naval Works Acts, which represents one-third of the total of the Vote has fallen by £58,000, and on some of the larger works schemes which have figured in recent estimates no further large expenditure remains to be incurred.

The proposals for entirely new works have been rigorously criticised and the items included in the Vote have been restricted to those which are essential to the safety of structures and ships, or are absolutely necessary for the efficiency of the Fleet and the proper accommodation of the personnel.

There is reduced provision for repairs and maintenance and for Oil Fuel Storage, but the sum of £200,000 already referred to has been included for the Naval Base at Singapore.

Vote 11 (*Travelling Expenses and Miscellaneous*).

Reduction—£852,300.

This Vote has been reduced by nearly 45 per cent., principally as a result of the progress made in liquidating the war liabilities with which the Vote has been heavily weighted, to reduction in the cost of travelling, and to economies in various directions.

Vote 12 (*Admiralty Office*).

Reduction—£140,400.

Reductions in the Headquarters Staff have been carried out during the past year where this has been possible.

The reductions already effected have, as was anticipated, thrown a heavy strain on the staffs, and especially in those departments where the volume of new or additional work is still considerable. It has been decided, however, to continue to effect reductions in these departments, as the liquidation work still in hand and the heavy increase of work due to reductions of Fleet personnel and discharge of Dockyard workmen are progressively cleared off.

Votes 13, 14, 15 (*Non-Effective Votes*).

Reduction—£2,266,400.

The measures for reducing the Active List necessitated special provision to the extent of £3,000,000 in the non-effective Votes for 1922-23, largely in the form of special gratuities and bonuses, and so non-recurrent. But they also involved substantial additions to the retired pay and pensions lists, which account for the increase of these Votes, in the present Estimates, above the figures for 1921-22.

February 27, 1923. L. S. A.

ABSTRACT OF THE NAVY ESTIMATES, 1923–24.

Votes.		Estimates for 1923–1924. Gross Estimate.	Estimates for 1923–1924. Net Estimate.	Estimates, 1922–1923. Net Estimate.
	I.—Numbers.		Maximum Numbers.	Maximum Numbers.
A.	Number of Officers, Seamen, Boys, and Royal Marines	99,500	99,500	118,500
	Number of Coastguard and Marine Police	1,423	1,423	2,900
	II.—Effective Services.	£	£	£
1	Wages, etc., of Officers, Seamen, and Boys, Coastguard, and Royal Marines	14,116,420	14,055,700	15,856,000
2	Victualling and Clothing for the Navy .	5,766,043	4,742,500	5,700,000
3	Medical Establishments and Services .	543,538	516,000	522,000
4	Civilians employed on Fleet Services .	196,223	194,900	292,100
5	Educational Services	399,949	353,000	411,000
6	Scientific Services	501,996	435,800	446,500
7	Royal Naval Reserves	580,842	572,800	543,300
8	Shipbuilding, Repairs, Maintenance, etc.:			
	Section I.—*Personnel* . .	6,761,010	6,694,000	7,680,100
	Section II.—*Matériel* . .	7,618,200	5,988,200	7,263,700
	Section III.—Contract Work .	5,130,460	5,031,450	3,334,500
9	Naval Armaments	5,493,297	5,344,900	5,064,500
10	Works, Buildings, and Repairs at Home and Abroad	3,907,850	3,832,850	4,273,000
11	Miscellaneous Effective Services . .	1,131,600	1,059,600	1,911,900
12	Admiralty Office	1,284,010	1,280,400	1,420,800
	Total Effective Services . £	53,431,438	50,102,100	54,719,400
	III.—Non-Effective Services.			
13	Naval and Marine, Officers	2,866,523	2,844,900	3,606,600
14	Naval and Marine, Men	4,310,790	4,260,800	5,522,600
15	Civil Superannuation, Compensation Allowances, and Gratuities . .	792,414	792,200	1,035,100
	Total Non-Effective Services . £	7,969,727	7,897,900	10,164,300
	GRAND TOTAL . . £	61,401,165	58,000,000	64,883,700

NET DECREASE . . . . . £6,883,700.
(NOTE—The Decrease on Gross Expenditure is £8,075,492.)

L. S. AMERY.
BEATTY.
H. F. OLIVER.
F. L. FIELD.

ALGERNON D. BOYLE.
ROGER KEYES.
C. FULLER.
LINLITHGOW.

B. EYRES MONSELL
O. MURRAY
Secretaries.

ADMIRALTY,
Feb. 27, 1923.

STATEMENT SHOWING THE NUMBERS BORNE, THE EXPENDITURE ON NAVAL SERVICES FOR THE YEARS 1914-1915 TO 1921-1922, AND THE ESTIMATES FOR 1922-1923 AND 1923-1924.

Year.	Vote A. — Average numbers borne.	Vote 1. — Wages, &c., of Officers, &c.	Vote 2. — Victualling and Clothing.	Vote 3. — Medical Establishments, &c.	Vote 4. — Civilians employed on Fleet Services.	Vote 5. — Educational Services.	Vote 6. — Scientific Services.	Vote 7. — Royal Naval Reserves.	Vote 8. — Shipbuilding, Repairs, Maintenance, &c.			Vote 9. — Naval Armaments.	Vote 10. — Works.	Vote 11. — Miscellaneous.	Vote 12 — Admiralty Office.	Vote 13. — Half Pay, &c.	Vote 14. — Naval, &c., Pensions.	Vote 15. — Civil Superannuation, &c.	Balances Irrecoverable.	Total Expenditure.
									Section I. Personnel.	Section II. Matériel.	Section III. Contract Work.									
		£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
1914-15	199,451	13,637,330	7,411,627	436,589	176,977	161,766	87,090	446,784	5,646,932	22,211,040	30 298,730	9,666,218	3,659,847	5,907,731	583,167	878,045	1,674,160	389,914	27,915	103,301,862
1915-16	297,008	24,321,519	10,796,024	578,703	444,907	171,610	108,535	755,201	7,868,812	44,778,970	64,513,255	25,649,203	5,710,782	16,321,128	851,066	717,519	1,730,117	400,161	17,085	205,733,597
1916-17	349,578	29,399,358	11,173,592	713,525	517,200	201,497	110,478	363,943	8,943,491	40,952,653	53,982,842	36,742,534	6,694,878	15,460,001	1,024,108	713,621	1,944,003	388,509	50,976	209,877,218
1917-18	406,977	37,559,536	13,481,159	792,569	561,308	210,243	152,160	874,930	12,660,160	36,494,694	70,609,055	34,177,359	6,556,769	9,193,802	1,454,835	709,227	1,446,247	413,746	41,092	227,388,891
1918-19	381,311	46,373,511	24,219,351	1,158,287	491,270	247,922	262,886	871,970	15,037,763	59,128,675	94,248,874	64,866,784	10,928,241	9,357,532	1,985,894	704,914	3,733,778	445,485	28,090	334,091,227
1919-20	176,087	32,385,306	8,823,106	733,046	556,778	401,864	364,832	458,044	12,426,177	*Credit :—* *785,986*	48,348,933	14,441,835	5,595,608	11,118,631	2,042,715	1,176,937	15,133,064	802,279	60,875	154,084,044
1920-21	124,009	21,314,360	8,311,708	683,830	759,110	503,152	249,185	359,694	12,096,747	6,799,965	12,001.445	8,493,951	4,992,969	5,724,974	2,073,764	2,352,344	4,847,475	880,996	23,611	92,505,290
1921-22	127,180	19,220,859	6,831,481	643,735	480,243	405,592	359,575	423,056	10,690,188	8,835,771	4,834,336	6,253,468	4,746,485	3,506,514	1,780,641	2,002,201	3,881,368	1,020,693	69,935	75,986,141
																Non-effective Services.				
																Officers.	Men.			
1922-23 (Estimate)	121,400(*a*)	15,856,000	5,700,000	522,000	292,100	411,000	446,500	543,300	7,680,100	7,263,700	3,334,500	5,064,500	4,273,000	1,911,900	1,420,800	3,606,600	5,522,600	1,035,100	—	64,883,700
1923-24 (Estimate)	100,923(*a*)	14,055,700	4,742,500	516,000	194,900	353,000	435,800	572,800	6,694,000	5,988,200	5,031,450	5,344,900	3,832,850	1,059,600	1,280,400	2,844,900	4,260,800	792,200	—	58,000,000

Note.—The figures under Vote 9 include the cost of Naval Aviation Services from the year 1916-1917 to the year 1919-1920 inclusive.

(*a*) Maximum for the year, including Coastguard and Marine Police.

EXPENDITURE FOR NAVAL PURPOSES OF THE PRINCIPAL FOREIGN POWERS.

UNITED STATES NAVY.

Appropriation Act (approved Jan. 22, 1923), July 1, 1923, to June 30, 1924.

(Total appropriations 1922–23, approximately 342,000,000 dollars.)

The figures following represent the outlay in 1923–24, but they are not precisely accurate because some unexpended balances are brought forward, and certain of the credits approved are to remain open at need until the following financial year. The headings are those of the Navy Appropriation Act:—

		Dollars.
Naval Secretary's Department, including various out-stations and Office of Naval Operations		3,816,000
Bureau of Navigation, including Transport and Recruiting, $4,000,000, and Naval Reserve, $3,594,000		10,406,250
Hydrographic Office, Observatory, etc.		533,920
Bureau of Engineering (Repairs, etc.)		14,869,000
Bureau of Construction and Repairs		16,074,000
Bureau of Ordnance (mainly for A.A. guns for the Maryland)		10,753,000
Bureau of Supplies and Accounts:		
Pay of the Navy	$121,446,892	
Maintenance, freight, fuel, etc.	43,254,000	164,700,892
Bureau of Medicine and Surgery		2,325,000
Bureau of Yards and Docks		8,830,190
Bureau of Aeronautics		14,793,560
Naval Academy		2,122,848
*Marine Corps:		
Pay	$16,891,005	
Quartermaster's Department	8,604,943	25,495,948
†Increase of the Navy		19,097,000
Total		293,817,608‡

* The United States Navy having its own Air Service, the pay of personnel, etc., is included under heading of Pay of the Navy.

† In addition, unexpended balances are to be applied to work permitted under the Treaty.

‡ The par rate of exchange is $4·866 to the £.

IMPERIAL JAPANESE NAVY.

Estimates, 1923–24.

The Estimates of the Imperial Japanese Navy, which in the previous year were 393,662,649 yen, for the financial year 1923–24 are divided under two headings, ordinary and extraordinary, the main details of which are as follow:—

Ordinary.

	Yen.
Admiralty	667,052
Pay and Allowances	38,007,660
Provisions and Clothing	15,982,091
Maintenance	24,723,790
Manœuvres	225,930
Shipbuilding, Armament and Repairs	35,981,837
Education	882,942
Secret Service	80,000
Miscellaneous	8,632,657
Total	125,183,959

EXTRAORDINARY.	Yen.
Armament and Munition Replenishment	120,233,878
Extraordinary Replenishment of Arms	400,000
Repairs and Extraordinary Construction	4,462,107
Dockyards and Works	18,660,000
Naval Dockyard Fund	1,350,000
Grand Naval Manœuvres	5,078,214
Aviation	210,840*
Miscellaneous	1,050,084
Total	151,445,123 †

Grand Total = Yen 276,629,082.

* The Japanese Navy maintains its own Air Service. Last year the recorded outlay was 349,530 yen.

† The par rate of exchange is 9·75 yen to the £.

FRENCH NAVY.

The French Navy Estimates are not drawn upon a system that makes it easy to compare them accurately, under specific headings, with the Estimates of other Powers. It has therefore been considered best to give the facts under the headings of ordinary and extraordinary expenditure. In 1922–23 the amounts voted were 766,759,895 francs (ordinary), and 31,045,019 francs (extraordinary), giving a total of 797,804,914 francs, to which must be added 180,000,000 francs for new construction. The grand total was thus 977,804,914 francs. In the subjoined figures for 1923–24 the new construction votes are included:—

	Francs.
Ordinary Expenditure	1,005,437,008
Extraordinary Expenditure	22,800,000
Total	1,028,237,008 *

* The par rate of exchange is 25·225 frs. to the £.

ROYAL ITALIAN NAVY.

ESTIMATES, 1923–24.

The amount voted for 1922–23 was 500,963,100 lire on the ordinary, and 110,189,000 on the extraordinary expenditure, which, with a floating credit of 3,030,667 lire, gave a total of 614,182,767 lire.

ORDINARY EXPENDITURE.	Lire.
General Expenses	4,490,885
Pensions	32,030,000
Education	2,990,000
Lighthouses and Pilotage	4,235,000
Maintenance, Construction, Armaments, Establishments and Coast Works	660,225,800
Total	703,971,685
EXTRAORDINARY EXPENSES.	
General and Various	66,593,330
FLOATING CREDIT	3,051,647
Total	773,616,662 *

* The par rate of exchange is 25·225 lire to the £.

NOTE.—On the Italian Navy Estimates, additional to the above, are borne votes for subsidies, port charges and services, and other expenditure for the mercantile marine. The total sum for 1923–24 is 273,945,060 lire.

WASHINGTON TREATY FOR THE LIMITATION OF NAVAL ARMAMENT.

THE United States of America, the British Empire, France, Italy and Japan:

Desiring to contribute to the maintenance of the general peace, and to reduce the burdens of competition in armament;

Have resolved, with a view to accomplishing these purposes, to conclude a treaty to limit their respective naval armament, and to that end have appointed as their Plenipotentiaries:

The President of the United States of America:
Charles Evans Hughes,
Henry Cabot Lodge,
Oscar W. Underwood,
Elihu Root,
Citizens of the United States;

His Majesty the King of the United Kingdom of Great Britain, and Ireland and of the British Dominions beyond the Seas, Emperor of India:
The Right Honourable Arthur James Balfour, O.M., M.P., Lord President of His Privy Council;
The Right Honourable Baron Lee of Fareham, G.B.E., K.C.B., First Lord of His Admiralty;
The Right Honourable Sir Auckland Campbell Geddes, K.C.B., His Ambassador Extraordinary and Plenipotentiary to the United States of America;
and

for the Dominion of Canada:
The Right Honourable Sir Robert Laird Borden, G.C.M.G., K.C.;

for the Commonwealth of Australia:
Senator the Right Honourable George Foster Pearce, Minister for Home and Territories;

for the Dominion of New Zealand:
The Honourable Sir John William Salmond, K.C., Judge of the Supreme Court of New Zealand;

for the Union of South Africa:
The Right Honourable Arthur James Balfour, O.M., M.P.;

for India:
The Right Honourable Valingman Sankaranarayana Srinivasa Sastri, Member of the Indian Council of State;

The President of the French Republic:
- Mr. Albert Sarraut, Deputy, Minister of the Colonies;
- Mr. Jules J. Jusserand, Ambassador Extraordinary and Plenipotentiary to the United States of America, Grand Cross of the National Order of the Legion of Honour.

His Majesty the King of Italy:
- The Honourable Carlo Schanzer, Senator of the Kingdom;
- The Honourable Vittoro Rolandi Ricci, Senator of the Kingdom, His Ambassador Extraordinary and Plenipotentiary at Washington;
- The Honourable Luigi Albertini, Senator of the Kingdom;

His Majesty the Emperor of Japan:
- Baron Tomosaburo Kato, Minister for the Navy, Junii, a member of the First Class of the Imperial Order of the Grand Cordon of the Rising Sun with the Paulownia Flower;
- Baron Kijuro Shidehara, His Ambassador Extraordinary and Plenipotentiary at Washington, Joshii, a member of the First Class of the Imperial Order of the Rising Sun;
- Mr. Masanao Hanihara, Vice-Minister for Foreign Affairs, Jushii, a member of the Second Class of the Imperial Order of the Rising Sun;

Who, having communicated to each other their respective full powers, found to be in good and due form, have agreed as follows:—

CHAPTER I.

GENERAL PROVISIONS RELATING TO THE LIMITATION OF NAVAL ARMAMENT.

ARTICLE I.

The Contracting Powers agree to limit their respective naval armament as provided in the present Treaty.

ARTICLE II.

The Contracting Powers may retain respectively the capital ships which are specified in Chapter II., Part 1. On the coming into force of the present Treaty, but subject to the following provisions of this Article, all other capital ships, built or building, of the United States, the British Empire and Japan shall be disposed of as prescribed in Chapter II., Part 2.

In addition to the capital ships specified in Chapter II., Part 1, the United States may complete and retain two ships of the "West Virginia" class now under construction. On the completion of these two ships the North Dakota and Delaware shall be disposed of as prescribed in Chapter II., Part 2.

The British Empire may, in accordance with the replacement table in Chapter II., Part 3, construct two new capital ships not exceeding 35,000 tons (36,560 metric tons) standard displacement each. On the completion of the said two ships the Thunderer, King George V., Ajax and Centurion shall be disposed of as prescribed in Chapter II., Part 2.

ARTICLE III.

Subject to the provisions of Article II., the Contracting Powers shall abandon their respective capital ship-building programmes, and no new capital ships shall be constructed or acquired by any of the Contracting Powers except replacement tonnage which may be constructed or acquired as specified in Chapter II., Part 3.

Ships which are replaced in accordance with Chapter II., Part 3, shall be disposed of as prescribed in Part 2 of that Chapter.

ARTICLE IV.

The total capital ship replacement tonnage of each of the Contracting Powers shall not exceed in standard displacement, for the United States, 525,000 tons (533,400 metric tons); for the British Empire, 525,000 tons (533,400 metric tons); for France, 175,000 tons (177,800 metric tons); for Italy, 175,000 tons (177,800 metric tons); for Japan 315,000 tons (320,040 metric tons).

ARTICLE V.

No capital ship exceeding 35,000 tons (35,560 metric tons) standard displacement shall be acquired by, or constructed by, for, or within the jurisdiction of, any of the Contracting Powers.

ARTICLE VI.

No capital ship of any of the Contracting Powers shall carry a gun with a calibre in excess of 16 inches (406 millimetres).

ARTICLE VII.

The total tonnage for aircraft carriers of each of the Contracting Powers shall not exceed in standard displacement, for the United States, 135,000 tons (137,160 metric tons); for the British Empire, 135,000 tons (137,160 metric tons); for France, 60,000 tons (60,960 metric tons); for Italy, 60,000 tons (60,960 metric tons); for Japan, 81,000 tons (82,296 metric tons).

ARTICLE VIII.

The replacement of aircraft carriers shall be effected only as prescribed in Chapter II., Part 3, provided, however, that all aircraft carrier tonnage in existence or building on November 12, 1921, shall be considered experimental, and may be replaced, within the total tonnage limit prescribed in Article VII., without regard to its age.

ARTICLE IX.

No aircraft carrier exceeding 27,000 tons (27,433 metric tons) standard displacement shall be acquired by, or constructed by, for or within the jurisdiction of, any of the Contracting Powers.

However, any of the Contracting Powers may, provided that its total tonnage allowance of aircraft carriers is not thereby exceeded, build not more than two aircraft carriers, each of a tonnage of not more than 33,000 tons (33,528 metric tons) standard displacement, and in order to effect economy any of the Contracting Powers may use for this purpose any two of their ships, whether constructed or in course of construction, which would otherwise be scrapped under the provisions of Article II. The armament of any aircraft carriers exceeding 27,000 tons (27,432 metric tons) standard displacement shall be in accordance with the requirements of Article X., except that the total number of guns to be carried in case any of such guns be of a calibre exceeding 6 inches (152 millimetres), except anti-aircraft guns and guns not exceeding 5 inches (127 millimetres), shall not exceed eight.

ARTICLE X.

No aircraft carrier of any of the Contracting Powers shall carry a gun with a calibre in excess of 8 inches (203 millimetres). Without prejudice to the provisions of Article IX., if the armament carried includes guns exceeding 6 inches (152 millimetres) in calibre the total number of guns carried, except anti-aircraft guns and guns not exceeding 5 inches (127 millimetres), shall not exceed ten. If alternatively the armament contains no guns exceeding 6 inches (152 millimetres) in calibre, the number of guns is not limited. In either case the number of anti-aircraft guns and of guns not exceeding 6 inches (127 millimetres) is not limited.

ARTICLE XI.

No vessel of war exceeding 10,000 tons (10,160 metric tons) standard displacement, other than a capital ship or aircraft carrier, shall be acquired by, or constructed by, for, or within the jurisdiction of, any of the Contracting Powers. Vessels not specifically built as fighting ships not taken in time of peace under Government control for fighting purposes, which are employed on fleet duties or as troop transports or in some other way for the purpose of assisting in the prosecution of hostilities otherwise than as fighting ships, shall not be within the limitations of this Article.

ARTICLE XII.

No vessel of war of any of the Contracting Powers, hereafter laid down, other than a capital ship, shall carry a gun with a calibre in excess of 8 inches (203 millimetres).

ARTICLE XIII.

Except as provided in Article IX., no ship designated in the present Treaty to be scrapped may be reconverted into a vessel of war.

ARTICLE XIV.

No preparations shall be made in merchant ships in time of peace for the installation of warlike armaments for the purpose of converting such ships into vessels of war, other than the necessary stiffening of decks for the mounting of guns not exceeding 6-inch (153 millimetres) calibre.

ARTICLE XV.

No vessel of war constructed within the jurisdiction of any of the Contracting Powers for a non-Contracting Power shall exceed the limitations as to displacement and armament prescribed by the present Treaty for vessels of a similar type which may be constructed by or for any of the Contracting Powers; provided, however, that the displacement for aircraft carriers constructed for a non-Contracting Power shall in no case exceed 27,000 tons (27,432 metric tons) standard displacement.

ARTICLE XVI.

If the construction of any vessel of war for a non-Contracting Power is undertaken within the jurisdiction of any of the Contracting Powers, such Power shall promptly inform the other Contracting Powers of the date of the signing of the contract and the date on which the keel of the ship is laid; and shall also communicate to them the particulars relating to the ship prescribed in Chapter II., Part 3, Section I. (*b*), (4) and (5).

ARTICLE XVII.

In the event of a Contracting Power being engaged in war, such Power shall not use as a vessel of war any vessel of war which may be under construction within its jurisdiction for any other Power, or which may have been constructed within its jurisdiction for another Power and not delivered.

ARTICLE XVIII.

Each of the Contracting Powers undertakes not to dispose by gift, sale or any mode of transfer of any vessel of war in such a manner that such vessel may become a vessel of war in the Navy of any foreign Power.

ARTICLE XIX.

The United States, the British Empire and Japan agree that the *status quo* at the time of the signing of the present Treaty, with regard to fortifications and naval bases, shall be maintained in their respective territories and possessions specified hereunder:—

1. The insular possessions which the United States now holds or may hereafter acquire in the Pacific Ocean, except (*a*) those adjacent to the coast of the United States, Alaska and the Panama Canal Zone, not including the Aleutian Islands, and (*b*) the Hawaiian Islands;

2. Hong Kong and the insular possessions which the British Empire now holds or may hereafter acquire in the Pacific Ocean, east of the meridian of 110° east longitude, except (*a*) those adjacent to the coast of Canada, (*b*) the Commonwealth of Australia and its territories, and (*c*) New Zealand;

3. The following insular territories and possessions of Japan in the Pacific Ocean, to wit: the Kurile Islands, the Bonin Islands, Amami-Oshima, the Loochoo Islands, Formosa and the Pescadores

and any insular territories or possessions in the Pacific Ocean which Japan may hereafter acquire.

The maintenance of the *status quo* under the foregoing provisions implies that no new fortifications or naval bases shall be established in the territories and possessions specified; that no measures shall be taken to increase the existing naval facilities for the repair and maintenance of naval forces, and that no increase shall be made in the coast defences of the territories and possessions above specified. This restriction, however, does not preclude such repair and replacement of worn-out weapons and equipment as is customary in naval and military establishments in time of peace.

ARTICLE XX.

The rules for determining tonnage displacement prescribed in Chapter II., Part 4, shall apply to the ships of each of the Contracting Powers.

CHAPTER II.

RULES RELATING TO THE EXECUTION OF THE TREATY—DEFINITION OF TERMS.

PART I.—CAPITAL SHIPS WHICH MAY BE RETAINED BY THE CONTRACTING POWERS.

In accordance with Article II. ships may be retained by each of Contracting Powers as specified in this Part.

Ships which may be retained by the United States.

Name.	Tonnage.
Maryland	32,600
California	32,300
Tennessee	32,300
Idaho	32,000
New Mexico	32,000
Mississippi	32,000
Arizona	31,400
Pennsylvania	31,400
Oklahoma	27,500
Nevada	27,500
New York	27,000
Texas	27,000
Arkansas	26,000
Wyoming	26,000
Florida	21,825
Utah	21,825
North Dakota	20,000
Delaware	20,000
Total tonnage	500,650

On the completion of the two ships of the "West Virginia" class and the scrapping of the "North Dakota" and "Delaware," as provided in Article II, the total tonnage to be retained by the United States will be 525,850 tons.

Ships which may be retained by the British Empire.

Name.	Tonnage.
Royal Sovereign	25,750
Royal Oak	25,750
Revenge	25,750
Resolution	25,750
Ramillies	25,750
Malaya	27,500
Valiant	27,500
Barham	27,500
Queen Elizabeth	27,500
Warspite	275,00
Benbow	25,000
Emperor of India	25,000
Iron Duke	25,000
Marlborough	25,000
Hood	41,200
Renown	26,500
Repulse	26,500
Tiger	28,500
Thunderer	22,500
King George V	23,000
Ajax	23,000
Centurion	23,000
Total tonnage	580,450

On the completion of the two new ships to be constructed and the scrapping of the Thunderer, King George V., Ajax and Centurion, as provided in Article II., the total tonnage to be retained by the British Empire will be 558,950 tons.

Ships which may be retained by France.

Name.	Tonnage (metric tons).
Bretagne	23,500
Lorraine	23,500
Provence	23,500
Paris	23,500
France	23,500
Jean Bart	23,500
Courbet	23,500
Condorcet	18,890
Diderot	18,890
Voltaire	18,890
Total tonnage	221,170

France may lay down new tonnage in the years, 1927, 1929 and 1931, as provided in Part 3, Section II.

Ships which may be retained by Italy.

Name.	Tonnage (metric tons).
Andrea Doria	22,700
Caio Duilio	22,700
Conte di Cavour	22,500
Giulio Cesare	22,500
Leonardo da Vinci	22,500
Dante Alighieri	19,500
Roma	12,600
Napoli	12,600
Vittorio Emanuele	12,600
Regina Elena	12,600
Total tonnage	182,800

Italy may lay down new tonnage in the years 1927, 1929 and 1931, as provided in Part 3, Section II.

Ships which may be retained by Japan.

Name.	Tonnage
Mutsu	33,800
Nagato	33,800
Hiuga	31,260
Ise	31,260
Yamashiro	30,600
Fu-So	30,600
Kirishima	27,500
Haruna	27,500
Hiyei	27,500
Kongo	27,500
Total tonnage	301,320

PART 2.—RULES FOR SCRAPPING VESSELS OF WAR.

The following rules shall be observed for the scrapping of vessels of war which are to be disposed of in accordance with Articles II. and III.

I. A vessel to be scrapped must be placed in such condition that it cannot be put to combative use.

II. This result must be finally effected in any one of the following ways:

(*a.*) Permanent sinking of the vessel;

(*b.*) Breaking the vessel up. This shall always involve the destruction or removal of all machinery, boilers and armour, and all deck, side and bottom plating;

(*c.*) Converting the vessel to target use exclusively. In such case all the provisions of paragraph III. of this Part, except sub-paragraph (6), in so far as may be necessary to enable the ship to be used as a mobile target, and except sub-paragraph (7), must be previously complied with. Not more than one capital ship may be retained for this purpose at one time by any of the Contracting Powers.

(*d.*) Of the capital ships which would otherwise be scrapped under the present Treaty in or after the year 1931, France and Italy may each retain two sea-going vessels for training purposes exclusively, that is, as gunnery or torpedo schools. The two vessels retained by France shall be of the "Jean Bart" class, and of those retained by Italy one shall be the Dante Alighieri, the other of the "Giulio Cesare" class. On retaining these ships for the purpose above stated, France and Italy respectively undertake to remove and destroy their conning-towers, and not to use the said ships as vessels of war.

III.—(*a.*) Subject to the special exceptions contained in Article IX., when a vessel is due for scrapping, the first stage of scrapping, which consists in rendering a ship incapable of further warlike service, shall be immediately undertaken.

(*b.*) A vessel shall be considered incapable of further warlike service when there shall have been removed and landed, or else destroyed in the ship:

1. All guns and essential portions of guns, fire-control tops and revolving parts of all barbettes and turrets;
2. All machinery for working hydraulic or electric mountings;
3. All fire-control instruments and range-finders;
4. All ammunition, explosives and mines;
5. All torpedoes, war-heads and torpedo tubes;
6. All wireless telegraphy installations;
7. The conning tower and all side armour, or alternatively all main propelling machinery; and
8. All landing and flying-off platforms and all other aviation accessories.

IV. The periods in which scrapping of vessels is to be effected are as follows:

(*a.*) In the case of vessels to be scrapped under the first paragraph of Article II., the work of rendering the vessels incapable of further warlike service, in accordance with paragraph III. of this Part shall be completed within six months from the coming into force of the present Treaty, and the scrapping shall be finally effected within eighteen months from such coming into force.

(*b.*) In the case of vessels to be scrapped under the second and third paragraphs of Article II., or under Article III., the work of rendering the vessel incapable of further warlike service in accordance with paragraph III. of this Part shall be commenced not later than the date of completion of its successor, and shall be finished within six months from the date of such completion. The vessel shall be finally scrapped, in accordance with paragraph II. of this Part, within eighteen months from the date of completion of its successor. If, however, the completion of the new vessel be delayed, then the work of rendering the old vessel incapable of further warlike service in accordance with paragraph III. of this Part shall be commenced within four years from the laying of the keel of the new vessel, and shall be finished within six months from the date on which such work was commenced, and the old vessel shall be finally scrapped in accordance with paragraph II. of this Part within eighteen months from the date when the work of rendering it incapable of further warlike service was commenced.

PART 3.—REPLACEMENT.

The replacement of capital ships and aircraft carriers shall take place according to the rules in Section I. and the tables in Section II. of this Part.

Section I.—*Rules for Replacement.*

(*a.*) Capital ships and aircraft carriers twenty years after the date of their completion may, except as otherwise provided in

Article VIII. and in the tables in Section II. of this Part, be replaced by new construction, but within the limits prescribed in Article IV. and Article VII. The keels of such new construction may, except as otherwise provided in Article VIII. and in the tables in Section II. of this Part, be laid down not earlier than seventeen years from the date of completion of the tonnage to be replaced, provided, however, that no capital ship tonnage, with the exception of the ships referred to in the third paragraph of Article II., and the replacement tonnage specifically mentioned in Section II. of this Part, shall be laid down until ten years from November 12, 1921.

(*b.*) Each of the Contracting Powers shall communicate promptly to each of the other Contracting Powers the following information:

1. The names of the capital ships and aircraft carriers to be replaced by new construction;
2. The date of governmental authorisation of replacement tonnage;
3. The date of laying the keels of replacement tonnage;
4. The standard displacement in tons and metric tons of each new ship to be laid down, and the principal dimensions namely, length at waterline, extreme beam at or below waterline, mean draft at standard displacement;
5. The date of completion of each new ship and its standard displacement in tons and metric tons, and the principal dimensions, namely, length at waterline, extreme beam at or below waterline, mean draft at standard displacement at time of completion.

(*c.*) In case of loss or accidental destruction of capital ships or aircraft carriers, they may immediately be replaced by new construction subject to the tonnage limits prescribed in Articles IV. and VII. and in conformity with the other provisions of the present Treaty, the regular replacement programme being deemed to be advanced to that extent.

(*d.*) No retained capital ships or aircraft carriers shall be reconstructed except for the purpose of providing means of defence against air and submarine attack, and subject to the following rules: The Contracting Powers may, for that purpose, equip existing tonnage with bulge or blister or anti-air attack deck protection, providing the increase of displacement thus effected does not exceed 3,000 tons (3,048 metric tons) displacement for each ship. No alterations in side armour, in calibre, number or general type of mounting of main armament shall be permitted except:

1. In the case of France and Italy, which countries within the limits allowed for bulge may increase their armour protection and the calibre of the guns now carried in their existing capital ships so as not to exceed 16 inches (406 millimetres), and
2. The British Empire shall be permitted to complete, in the case of the Renown, the alterations to armour that have already been commenced but temporarily suspended.

Section II.—*Replacement and Scrapping of Capital Ships.*

UNITED STATES.

Year.	Ships laid down.	Ships completed.	Ships scrapped (age in parentheses).	Ships retained. Summary.	
				Pre-Jutland.	Post-Jutland.
			Maine (20), Missouri (20), Virginia (17), Nebraska (17), Georgia (17), New Jersey (17), Rhode Island (17), Connecticut (17), Louisiana (17), Vermont (16), Kansas (16), Minnesota (16), New Hampshire (15), South Carolina (13), Michigan (13), Washington (0), South Dakota (0), Indiana (0), Montana (0), North Carolina (0), Iowa (0), Massachussetts (0), Lexington (0), Constitution (0), Constellation (0), Saratoga (0), Ranger (0), United States (0) *	17	1
1922	...	A, B†	Delaware (12), North Dakota (12)	15	3
1923	...	...	... ...	15	3
1924	...	...	... ...	15	3
1925	...	...	... ...	15	3
1926	...	...	... ...	15	3
1927	...	...	... ...	15	3
1928	...	...	... ...	15	3
1929	...	...	... ...	15	3
1930	...	...	... ...	15	3
1931	C, D	...	... ...	15	3
1932	E, F	...	... ...	15	3
1933	G	...	... ...	15	3
1934	H, I	C, D	Florida (23), Utah (23), Wyoming (22)	12	5
1935	J	E, F	Arkansas (23), Texas (21), New York (21)	9	7
1936	K, L	G	Nevada (20), Oklahoma (20) ...	7	8
1937	M	H, I	Arizona (21), Pennsylvania (21) ...	5	10
1938	N, O	J	Mississippi (21)	4	11
1939	P, Q	K, L	New Mexico (21), Idaho (20) ...	2	13
1940	...	M	Tennessee (20)	1	14
1941	...	N, O	California (20), Maryland (20) ...	0	15
1942	...	P, Q	2 ships "West Virginia" class ...	0	15

* The United States may retain the Oregon and Illinois, for non-combatant purposes, after complying with the provisions of Part 2, III (*b*).

† Two "West Virginia" class.

NOTE.—A, B, C, D, etc., represent individual capital ships of 35,000 tons standard displacement, laid down and completed in the years specified.

BRITISH EMPIRE.

Year.	Ships laid down.	Ships completed.	Ships scrapped (age in parentheses).	Ships retained. Summary.	
				Pre-Jutland.	Post-Jutland.
			Commonwealth (16), Agamemnon (13), Dreadnought (15), Bellerophon (12), St. Vincent (11), Inflexible (13), Superb (12), Neptune (10), Hercules (10), Indomitable (13), Temeraire (12), New Zealand (9), Lion (9), Princess Royal (9), Conqueror (9), Monarch (9), Orion (9), Australia (8), Agincourt (7), Erin (7), 4 building or projected	21	1
1922	A, B†	...	... ...	21	1
1923	...	...	... ...	21	1
1924	...	...	... ...	21	1
1925	...	A, B	King George V (13), Ajax (12), Centurion (12), Thunderer (13)	17	3
1926	...	...	... ...	17	3
1927	...	...	... ...	17	3
1928	...	...	... ...	17	3
1929	...	...	... ...	17	3
1930	...	...	... ...	17	3
1931	C, D	...	... ...	17	3
1932	E, F	...	... ...	17	3
1933	G	...	... ...	17	3
1934	H, I	C, D	Iron Duke (20), Marlborough (20), Emperor of India (20), Benbow (20)	13	5
1935	J	E, F	Tiger (21), Queen Elizabeth (20), Warspite (20), Barham (20)	9	7
1936	K, L	G	Malaya (20), Royal Sovereign (20)	7	8
1937	M	H, I	Revenge (21), Resolution (21) ...	5	10
1938	N, O	J	Royal Oak (22)	4	11
1939	P, Q	K, L	Valiant (23, Repulse (23)	2	13
1940	...	M	Renown (24)	1	14
1941	...	N, O	Ramillies (24), Hood (21) ...	0	15
1942	...	P, Q	A (17), B (17)	0	15

* The British Empire may retain the Colossus and Collingwood for non-combatant purposes after complying with the provisions of Part 2, III. (*b*).

† Two 35,000-ton ships, standard displacement.

NOTE.—A, B, C, D, etc., represent individual capital ships of 35,000 tons standard displacement laid down and completed in the years specified.

FRANCE.

Year.	Ships laid down.	Ships completed.	Ships scrapped (age in parentheses).	Ships retained. Summary.	
				Pre-Jutland.	Post-Jutland.
	Tons.	Tons.			
1922	...	...	... ...	7	0
1923	...	...	... ...	7	0
1924	...	...	... ...	7	0
1925	...	...	... ...	7	0
1926	...	...	... ...	7	0
1927	35,000	...	... ...	7	0
1928	...	...	... ...	7	0
1929	35,000	...	... ...	7	0
1930	...	35,000	Jean Bart (17), Courbet (17) ...	5	*
1931	35,000	...	... ...	5	*
1932	35,000	35,000	France (18)	4	*
1933	35,000	...	... ...	4	*
1934	...	35,000	Paris (20), Bretagne (20)	2	
1935	...	35,000	Provence (20)	1	*
1936	...	35,000	Lorraine (20)	0	*
1937	...	...	... ...	0	*
1938	...	...	... ...	0	*
1939	..	...	... ...	0	*
1940	...	...	... ...	0	*
1941	...	...	... ...	0	*
1942	...	...	... ...	0	*

NOTE.—France expressly reserves the right of employing the capital ship tonnage allotment as she may consider advisable, subject solely to the limitations that the displacement of individual ships should not surpass 35,000 tons, and that the total capital ship tonnage should keep within the limits imposed by the present Treaty.

ITALY.

Year.	Ships laid down.	Ships completed.	Ships scrapped (age in parentheses).	Ships retained. Summary.	
				Pre-Jutland.	Post-Jutland.
	Tons.	Tons.			
1922	...	...	... ...	6	0
1923	...	...	... ...	6	0
1924	...	...	... ...	6	0
1925	...	...	... ...	6	0
1926	...	...	... ...	6	0
1927	35,000	...	... ...	6	0
1928	...	...	... ...	6	0
1929	35,000	...	... ...	6	0
1930	...	...	... ...	6	0
1931	35,000	35,000	Dante Alighieri (19)	5	*
1932	45,000	...	... ...	5	*
1933	25,000	35,000	Leonardo da Vinci (19)	4	*
1934	...	...	... ...	4	*
1935	...	35,000	Giulio Cesare (21)	3	*
1936	...	45,000	Conte di Cavour (21), Duilio (21)	1	*
1937	...	25,000	Andrea Doria	0	*

NOTE.—Italy expressly reserves the right of employing the capital ship tonnage allotment as she may consider advisable, subject solely to the limitations that the displacement of individual ships should not surpass 35,000 tons, and the total capital ship tonnage should keep within the limits imposed by the present Treaty.

* Within tonnage limitations; number not fixed.

JAPAN.

Year.	Ships laid down.	Ships completed.	Ships scrapped (age in parentheses).	Ships retained. Summary.	
				Pre-Jutland.	Post-Jutland
		...	Hizen (20), Mikasa (20), Kashima (16), Katori (16), Satsuma (12), Aki (11), Settsu (10), Ikoma (11), Ibuki (12), Kurama (11), Amagi (0), Akagi (0), Kaga (0), Tosa (0), Takao (0), Atago (0). Projected programme 8 ships not laid down.*	8	2
1922	...	...	... ...	8	2
1923	...	...	... ...	8	2
1924	...	...	... ...	8	2
1925	...	...	... ...	8	2
1926	...	...	... ...	8	2
1927	...	...	... ...	8	2
1928	...	...	... ...	8	2
1929	...	...	... ...	8	2
1930	...	...	... ...	8	2
1931	A	...	... ...	8	2
1932	B	...	... ...	8	2
1933	C	...	... ...	8	2
1934	D	A	Kongo (21)	7	3
1935	E	B	Hiyei (21), Haruna (20)	5	4
1936	F	C	Kirishima (21)	4	5
1937	G	D	Fuso (22)	3	6
1938	H	E	Yamashiro (21)	2	7
1939	I	F	Ise (22)	1	8
1940	...	G	Hiuga (22)	0	9
1941	...	H	Nagato (21)	0	9
1942	...	I	Mutsu (21)	0	9

* Japan may retain the Shikishima and Asahi for non-combatant purposes, after complying with the provisions of Part 2, III. (*b*).

NOTE.—A, B, C, D, &c., represent individual capital ships of 35,000 tons standard displacement, laid down and completed in the years specified.

Note Applicable to all the Tables in Section II.

The order above prescribed in which ships are to be scrapped is in accordance with their age. It is understood that when replacement begins according to the above tables the order of scrapping in the case of the ships of each of the Contracting Powers may be varied at its option; provided, however, that such Power shall scrap in each year the number of ships above stated.

PART 4.—DEFINITIONS.

For the purposes of the present Treaty, the following expressions are to be understood in the sense defined in this Part.

Capital Ship.

A capital ship, in the case of ships hereafter built, is defined as a vessel of war, not an aircraft carrier, whose displacement exceeds

10,000 tons (10,160 metric tons) standard displacement, or which carries a gun with a calibre exceeding 8 inches (203 millimetres).

Aircraft Carrier.

An aircraft carrier is defined as a vessel of war with a displacement in excess of 10,000 tons (10,160 metric tons) standard displacement designed for the specific and exclusive purpose of carrying aircraft. It must be so constructed that aircraft can be launched therefrom and landed thereon, and not designed and constructed for carrying a more powerful armament than that allowed to it under Article IX. or Article X. as the case may be.

Standard Displacement.

The standard displacement of a ship is the displacement of the ship complete, fully manned, engined, and equipped ready for sea, including all armament and ammunition, equipment, outfit, provisions and fresh water for crew, miscellaneous stores and implements of every description that are intended to be carried in war, but without fuel or reserve feed water on board.

The word " ton " in the present Treaty, except in the expression "metric tons," shall be understood to mean the ton of 2,240 pounds (1,016 kilog.).

Vessels now completed shall retain their present ratings of displacement tonnage in accordance with their national system of measurement. However, a Power expressing displacement in metric tons shall be considered for the application of the present Treaty as owning only the equivalent displacement in tons of 2,240 pounds.

A vessel completed hereafter shall be rated at its displacement tonnage when in the standard condition defined herein.

CHAPTER III.

MISCELLANEOUS PROVISIONS.

ARTICLE XXI.

If during the term of the present Treaty the requirements of the national security of any Contracting Power in respect of naval defence are, in the opinion of that Power, materially affected by any change of circumstances, the Contracting Powers will, at the request of such Power, meet in conference with a view to the consideration of the provisions of the Treaty and its amendment by mutual agreement.

In view of possible technical and scientific developments, the United States, after consultation with the other Contracting Powers, shall arrange for a conference of all the Contracting Powers which shall convene as soon as possible after the expiration of eight years from the coming into force of the present Treaty to consider what changes, if any, in the Treaty may be necessary to meet such developments.

ARTICLE XXII.

Whenever any Contracting Power shall become engaged in a war which in its opinion affects the naval defence of its national security, such Power may after notice to the other Contracting Powers suspend for the period of hostilities its obligations under the present Treaty other than those under Articles XIII. and XVII., provided that such Power shall notify the other Contracting Powers that the emergency is of such a character as to require such suspension.

The remaining Contracting Powers shall in such case consult together with a view to agreement as to what temporary modifications, if any, should be made in the Treaty as between themselves. Should such consultation not produce agreement, duly made in accordance with the constitutional methods of the respective Powers, any one of the said Contracting Powers may, by giving notice to the other Contracting Powers, suspend for the period of hostilities its obligations under the present Treaty, other than under those Articles XIII. and XVI.

On the cessation of hostilities the Contracting Powers will meet in conference to consider what modifications, if any, should be made in the provisions of the present Treaty.

ARTICLE XXIII.

The present Treaty shall remain in force until December 31, 1936, and in case none of the Contracting Powers shall have given notice two years before that date of its intention to terminate the Treaty, it shall continue in force until the expiration of two years from the date on which notice of termination shall be given by one of the Contracting Powers, whereupon the Treaty shall terminate as regards all the Contracting Powers. Such notice shall be communicated in writing to the Government of the United States, which shall immediately transmit a certified copy of the notification to the other Powers and inform them of the date on which it was received. The notice shall be deemed to have been given and shall take effect on that date. In the event of notice of termination being given by the Government of the United States, such notice shall be given to the diplomatic representatives at Washington of the other Contracting Powers, and the notice shall be deemed to have been given and shall take effect on the date of the communication made to the said diplomatic representatives.

Within one year of the date on which a notice of termination by any Power has taken effect, all the Contracting Powers shall meet in conference.

ARTICLE XXIV.

The present Treaty shall be ratified by the Contracting Powers in accordance with their respective constitutional methods and shall take effect on the date of the deposit of all the ratifications, which shall take place at Washington as soon as possible. The Government of the United States will transmit to the other Contracting Powers a certified copy of the *procès-verbal* of the deposit of ratifications.

The present Treaty, of which the English and French texts are both authentic, shall remain deposited in the archives of the Government of the United States, and duly certified copies thereof shall be transmitted by the Government to the other Contracting Powers.

In faith whereof the above-named Plenipotentiaries have signed the present Treaty.

TREATY TO PROTECT NEUTRALS AND NON-COMBATANTS AT SEA IN TIME OF WAR AND TO PREVENT USE IN WAR OF NOXIOUS GASES AND CHEMICALS.

I.

THE Signatory Powers declare that among the rules adopted by civilised nations for the protection of the lives of neutrals and non-combatants at sea in time of war, the following are to be deemed an established part of international law:—

1. A merchant vessel must be ordered to submit to visit and search to determine its character before it can be seized.

A merchant vessel must not be attacked unless it refuse to submit to visit and search after warning, or to proceed as directed after seizure.

A merchant vessel must not be destroyed unless the crew and passengers have been first placed in safety.

2. The belligerent submarines are not under any circumstances exempt from the universal rules above stated; and if a submarine cannot capture a merchant vessel in conformity with these rules the existing law of nations requires it to desist from attack and from seizure and to permit the merchant vessel to proceed unmolested.

II.

The Signatory Powers invite all other civilised Powers to express their assent to the foregoing statement of established law, so that there may be a clear public understanding throughout the world of the standards of conduct by which the public opinion of the world is to pass judgment upon future belligerents.

III.

The Signatory Powers, desiring to ensure the enforcement of the humane rules of existing law declared by them with respect to attacks upon and the seizure and destruction of merchant ships, further declare that any person in the service of any Power who shall violate any of those rules, whether or not such person is under orders of a governmental superior, shall be deemed to have violated the laws of war and shall be liable to trial and punishment as if for an act of piracy and may be brought to trial before the civil or military authorities of any Power within the jurisdiction of which he may be found.

IV.

The Signatory Powers recognise the practical impossibility of using submarines as commerce destroyers without violating, as they were violated in the recent war of 1914–1918, the requirements universally accepted by civilised nations for the protection of the lives of neutrals and non-combatants, and to the end that the prohibition of the use of submarines as commerce destroyers shall be universally accepted as a part of the law of nations they now accept that prohibition as henceforth binding as between themselves and they invite all other nations to adhere thereto.

V.

The use in war of asphyxiating, poisonous or other gases, and all analogous liquids, materials or devices, having been justly condemned by the general opinion of the civilised world and a prohibition of such use having been declared in Treaties to which a majority of the civilised Powers are parties,

The Signatory Powers, to the end that this prohibition shall be universally accepted as a part of international law binding alike the conscience and practice of nations, declare their assent to such prohibition, agree to be bound thereby as between themselves and invite all other civilised nations to adhere thereto.

VI.

The present Treaty shall be ratified as soon as possible in accordance with the constitutional methods of the Signatory Powers and shall take effect on the deposit of all the ratifications, which shall take place at Washington.

The Government of the United States of America will transmit to all the Signatory Powers a certified copy of the *procès-verbal* of the deposit of ratifications.

The present Treaty, of which the French and English texts are both authentic, shall remain deposited in the archives of the Government of the United States of America, and duly certified copies thereof will be transmitted by that Government to each of the Signatory Powers.

VII.

The Government of the United States of America will further transmit to each of the Non-Signatory Powers a duly certified copy of the present Treaty and invite its adherence thereto.

Any Non-Signatory Power may adhere to the present Treaty by communicating an Instrument of Adherence to the Government of the United States of America, which will thereupon transmit to each of the Signatory and Adhering Powers a certified copy of each Instrument of Adherence.

In faith whereof, the above-named Plenipotentiaries have signed the present Treaty.

BRITISH AND FOREIGN NAVAL ATTACHES.

British Naval Attachés Accredited to Foreign Countries.

To:—

Albania, Bulgaria, Fiume, Greece, Italy, Roumania, Serbia, and Turkey: Naval Attaché, Commander Reginald T. Down, C.V.O., D.S.O. (appointed 14th July, 1922); Headquarters, Rome, Italy.

Belgium, France, Poland, Portugal and Spain: Naval Attaché, Commander Edward B. C. Dicken, D.S.C. (appointed 20th September, 1922); Headquarters, Paris, France.

Denmark, Esthonia, Finland, Latvia, Netherlands, Norway and Sweden: Naval Attaché, Captain Wion M. Egerton (appointed 15th February, 1923; Headquarters, Helsingfors, Finland.

Japan and China: Naval Attaché, Captain Ragnor M. Colvin, C.B.E. (appointed 10th March, 1922): Headquarters, Tokyo, Japan.

North and Central America, including Costa Rica, Cuba, Haiti, Honduras, Mexico, Nicaragua, Panama, Salvador, San Domingo, and the United States: Naval Attaché, Captain Francis L. Tottenham, C.B.E. (appointed 4th October, 1922); Assistant Naval Attaché, Engineer-Commander Harold A. Brown (appointed 15th July, 1921): Headquarters, Washington, D.C., U.S.A.

South America, including the Argentine Republic, Brazil, Chile, Columbia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela: Naval Attaché, Captain Gerard A. Wells (appointed 8th June, 1923).

Foreign Naval Attachés Accredited to Great Britain.

From:—

Argentine Republic: Naval Attaché, Commander Jorge Games: Address, Argentine Legation, 26, Park Lane, London, W.1.

Brazil: Naval Attaché, Commander Americo de Araujo Pimentel: Address, 19, Upper Brook Street, London, W.1.

Denmark: Naval Attaché, Commander C. V. Evers: Address, 29, Pont Street, London, S.W.1.

France: Naval Attaché, Capitaine de Frégate de Ruffi de Pontevès-Gévaudan, D.S.O.: Address, Albert Gate House, Hyde Park, London, S.W.1.

Italy: Naval Attaché, Captain Luigi Bianchi, I.R.N.: Address, 18, Linden Gardens, London, W.2.

Japan: Naval Attaché, Rear-Admiral Tamaki Tosu, C.B.; Assistant Naval Attaché, Lieut.-Commander Shiro Takasu: Address, Broadway Court, Broadway, Westminster, London, S.W.1.

Norway: Naval Attaché, Captain Sigurd Scott-Hansen: Address, Norway House, 21–24, Cockspur Street, Westminster, London, S.W.1.

Portugal: Naval Attaché, Commander Fernando Branco: Address, 12, Taviton Street, Gordon Square, London, W.C.1.

Spain: Naval Attaché, Captain Don Eliseo Sandriz: Address, 1, Grosvenor Gardens, Westminster, London, S.W.1.

Sweden: Naval Attaché, Commander A. H. de Bahr: Address, 27, Portland Place, London, W.1.

United States of America: Naval Attaché, Captain Charles L. Hussey; Assistant Naval Attachés, Commander Francis J. Cleary, Commander John H. Towers, and Lieutenant-Commander Thaddeus A. Thomson, Jr.: Address, 6, Grosvenor Gardens, Westminster, London, S.W.1.

MERCHANT SHIPPING
REFERENCE SECTION.

IMPERIAL SHIPPING COMMUNICATIONS.

THE question of Imperial Shipping Communications was considered at the Imperial Economic Conference, attended by British, Dominion, Crown Colonial, and Indian Ministers, which sat in London during October and November 1923, and below we reprint the official report, slightly abbreviated, of the proceedings relating to this question, together with the resolutions finally adopted. The general discussion of the subject was opened with a full statement by Sir Halford Mackinder, Chairman of the Imperial Shipping Committee, delivered at a meeting of the Imperial Economic Conference on Wednesday October 17, 1923. The Chair was occupied by the Right Hon. Sir P. Lloyd-Greame, President of the Board of Trade.

Sir **HALFORD MACKINDER** said:

Mr. President, I imagine that the Conference would probably like me, in the first instance, to say a few words by way of report on the work of the Committee itself, because, of course, the Committee was the child of the Imperial Conference. It originated, you will remember, in a resolution passed at the 1918 Conference, on the initiative, I think, of Mr. Massey. I may remind you that at first the idea was that there should be two bodies concerned with the shipping of the Empire, the one charged with considering improvements, the other charged with the consideration of complaints. But, after discussion at the 1918 Conference, it was determined that there should be only one Imperial Shipping Committee, because it was felt that such a single body would carry more weight and also that you would get better people to serve upon it. May I remind the Conference that the Committee technically is what is known here as a Prime Minister's Committee. It is appointed by the Prime Minister of the United Kingdom, but practically it is an Imperial Committee, because the Prime Minister nominates the representatives of the different parts of the Empire at the suggestion of the several parts. Several Dominions have for their representatives their High Commissioners in London: that is so in the case of India also. Others, as in the case of Australia, have chosen shipping experts. Then, in addition, there is a certain number of persons experienced in shipping and commerce—two chairmen of great shipping companies, one chairman of a great shipbuilding company, and two merchants who have both of them, I think, been Presidents of important Chambers of Commerce. So that the Committee is both representative of the whole Empire and it is also, within limits, expert. The Committee, of course, differs from all ordinary Committees appointed by the British Prime Minister in that it is instructed to report direct to all or any of the Governments of the Empire; and nearly all our reports, as the Prime Ministers will remember, have been addressed to the Prime Ministers of all the Governments of the Empire.

There was some delay after the 1918 Conference because there were negotiations in regard to the Constitution of the Committee, and the Committee did not get to work until the autumn of 1920, just three years ago. Since that time there have been sixty meetings of the full Committee, many meetings of sub-committees, and a certain number of conferences between parties in dispute, over which I have presided as the impartial Chairman of the Imperial Shipping Committee. It is purely an advisory Committee, of course, but if you are to measure what the Committee has been able to do and to express satisfaction or dissatisfaction, it is necessary also to remember that it has no power to compel the attendance of witnesses or to compel the production of papers or accounts, and it has no money wherewith to obtain technical advice or criticism in regard to any propositions that may be put before it.

Now, recognising these limitations, we decided very early in the history of the Committee that it was necessary that we should set to work in order to accomplish two things; in the first place that, if possible, we should always be unanimous. Our advice would carry weight in proportion to the degree of our agreement. I am glad to say that all the reports from time to time sent to the Prime Ministers have been as a fact unanimous. That has been accomplished by one method to which I would venture to draw your attention, and that is, that we determined that actual members of the Committee representative of particular Governments should not themselves initiate subjects for our discussion. Had they done so, they would have become advocates. Therefore, we took the course of requiring that when any Government or any body brought a case before us, that case should come before us officially from the Government in writing and should be supported by witnesses sent by the Government office or by the representatives of any other body. The representative of a particular Government—it might be New Zealand, Australia or Canada—would watch the case and see that it was properly developed, but he would be perfectly free at the end to associate himself with his colleagues from the other parts of the Empire, and he has always done so, with the result that we have always obtained unanimous reports.

The other matter on which we had to steer with great care was in regard to outside authorities and interests. It is quite obvious that dealing with such matters as we have to deal with, the departments of various Governments might feel that we were infringing on their spheres. The shipowners, also, were very suspicious of us—naturally they felt that they had had their fill of Government interference during the war and immediately afterwards—and, therefore, we had to steer very carefully so as to acquire goodwill, and I am happy to say that we have succeeded in obtaining the goodwill of the shipowners.

We started by taking up that portion of our reference which directed us to survey the facilities for shipping within the Empire. We took a certain amount of evidence. We sent out *questionnaires*, and in the course of about six months we compiled a considerable amount of information which has undoubtedly been useful since, but then two things happened. On the one hand we began to find that the whole of the shipping world was so busy recovering from the disorder into which it had been thrown by the war, that it was hopeless to think that we should be able to make any general report for a considerable time to come, which would not be out of date before it had actually been presented; and then, on the second hand, we found that about the end of six months we were overwhelmed with complaints, and it was necessary to turn to the second part of our reference.

Undoubtedly in the shipping world there was a considerable amount of irritation, and my colleagues and I felt that under all the circumstances we could not do better than to turn our attention to the allaying of that irritation, which we felt to have certain elements of danger in it. The chief ship-owning community of the Empire, of course, is the United Kingdom. On the other hand, the Dominions and India, and in equal degree proportionately to their size, also the Colonies and Protectorates have this in common, that they are all dependent on exports; we here are dependent on the export of our coal and manufactures, and obviously producers of primary products over the seas are equally dependent in their different ways.

Therefore, as between the producers in large portions of the Empire and the ship-owning interests in this country such irritation as there was took on a geographical aspect. It tended also to become, if I may venture to say so, political; that is to say, the producer in New Zealand, or in Australia, or in any other part of the Empire, feeling he had a grievance against the shipowners, sought to influence the politics of his own region, and the shipowners were thrown on to the defensive and sought help at this end. That in itself was obviously a most undesirable condition of affairs. It did not make for friendship within the Empire and might in conceivable circumstances ripen into a condition of things which one would not like to contemplate. We laid ourselves out then to try and smooth down these differences.

The first great complaint that came before us we reported on to the last Imperial Conference, but inasmuch as there have been further developments since that time and since developments are in progress at this moment in regard to it, I must mention it very shortly, and that is the question of shipowners' liability under bills of lading. That, of course, was a very old question, but it became acute after the war on account of the prevalence of pilferage. Under the British Common Law the shipowner, as a common carrier, is liable for the goods entrusted to him for conveyance, but under the same Common Law he is free to contract himself out of his liability, and the practice had arisen of so contracting himself out by endorsing in various ways the bill of lading. The result had been that there was a dispute involving at least four different sets of people. The shipowner naturally wished to eliminate liability as much as possible. The banker who had to deal with bills of exchange supported by bills of lading naturally wished to be able to handle the bill of lading knowing without examining it too closely what its contents must be. He did not wish to have to examine every bill of lading to find out what had been written into it. The merchant and the producer wished to have the maximum protection and wished to have recourse against all the people he could, including the shipowner. Finally, the underwriter, in view of the amount of pilferage that was going on, wished to make the servants of the shipowner more careful and to impose upon them a responsibility. The whole position was complicated by the fact that the practice of endorsement being customary in the United Kingdom was at variance with the law in the United States and within the Empire in both Canada and Australia. We determined in the end unanimously to recommend that the shipowner should not be free to contract himself out of his liability, and we recommended that throughout the Empire the Canadian Act should be accepted as the model, and that we should try to have a similar condition of affairs right through the Empire. I may say, incidentally, that we sounded shipping interests outside. They did not much like the change that we proposed, but those interests that we consulted agreed that they would not oppose provided there were certain safeguards inserted, and we arrived at a unanimous compromise on that subject. Our Report was published, having been sent to the various Prime Ministers, and was accepted by the last Imperial Conference. The whole Empire, therefore, by the resolution at that Conference, undertook to legislate in the same direction, but immediately after that Conference a movement took place to internationalise the practice which was to be established within the Empire. Meetings were held and a series of rules known as the Hague Rules were passed, and maritime countries were asked to legislate to make the Hague Rules the law in their several jurisdictions.

Then there arose an agitation on the part of shippers, of a certain number of shippers in this country, who asked to have the Imperial Shipping Committee's Report translated into Law rather than the Hague Rules, their point being that our compromise had given greater security to the shipper as against the shipowner than the Hague Rules. Further discussions took place and the Hague Rules were modified, and on behalf of my colleagues on the Imperial Shipping Committee I have to say that we considered the modified Rules and, if our opinion is desired, we think that they carry out the intention of the Report which was presented to us unanimously and endorsed by the last Imperial Conference. There is this further fact, that the shipowners and shippers as represented by their different Conferences and Associations are agreed in international conference on this matter, with very few exceptions. Only within the last ten days a meeting has been held, I think it was in Brussels, and I understand that the differences are now so small that it is almost certain that on the basis of the amended Hague Rules you will be able to get a world-wide common practice in this matter of vital importance to the commercial world. A Bill has been introduced into the House of Lords here, was referred to a Joint Committee of the two Houses, has been unanimously endorsed by that Joint Committee, and if this Conference is willing to accept as equivalent to what was adopted at the last Conference the Hague Rules as now modified and as scheduled in the Bill before the British Parliament, then I imagine that Bill will be pressed forward and the hope of those of us who have been busy with it for the last three years is that it may now be accepted as a model Bill and that we may see legislation with a view to uniformity in the Empire, we hope by way of an example to other nations, and in the end throughout the world.

There are certain inconveniences occasionally attaching to giving a "shipped" bill of lading, and you may have goods lodged in the warehouse of the ship-owning company for shipment at the earliest practicable date, and the producer in some cases wants to get his money before the goods have actually been put on board ship. A practice arose of giving a "Received for Shipment" bill of lading. The bankers were very insistent that every bill of lading should state facts—should state no more than the truth. If the goods had been shipped, it must say so, but if they had only been received for shipment, it must not say they have been shipped; otherwise, faith in the value of the document will be lost. Two questions came before us in regard to Received for Shipment bills of lading. The first came from the Far East, from the shippers and merchants interested in the trade of Singapore and Hong Kong, and there I presided as Chairman of the Imperial Shipping Committee over a Conference, and we were able to arrive at a *modus vivendi*, the essence of which was that there should be two forms of bill of lading: the one should say "Shipped" and should be printed wholly in black, and the other might say "Received for Shipment"—those words being printed in red. The bankers would then know at a glance what type of document they were dealing with.

The other difficulty arose in regard to New Zealand. Sir James Allen brought before the Imperial Shipping Committee certain difficulties, and it was arranged that, again acting as Chairman of the Committee, I should preside at a Conference at which were present shipowners and the representatives of the New Zealand producers of wool. We were again able to arrange a compromise, the details of which I need not go into, on conditions which were accepted by the bankers, and the result was that the producers were able to obtain their money without undue delay.

The next great question that came before us had regard to deferred rebates. A Royal Commission had sat upon this question as a result of difficulties which had arisen early in the century with regard to South Africa. It produced a majority report, a minority report, and a report of a single member, which last was a very weighty document. The recommendations have practically not been acted upon. As in the case of the bill of lading question, so in the case of deferred rebates, there was a certain acuteness in the dispute immediately after the war. That was due to the fact of Government ownership of merchant shipping. The question came before us in the first instance, and mainly, on a representation from the Australian Commonwealth Government. There was a quarrel between the Commonwealth Government Line and the Australian Conference of Steamship Lines, the matter brought before us turning on the question of deferred rebates. The Australian Government Line could not give rebates—it was forbidden to do so by Commonwealth legislation. The Australian Conference of Shipping Lines stuck tenaciously to its practice of giving rebates, on the outward voyage, of course, but inasmuch as the round voyage is the unit of shipping, that had its repercussion on the homeward trade. We examined this question, and we presented two reports, an interim report and a final report. The interim report dealt with a special and urgent point. The Commonwealth Government Line represented to us that those who shipped with them had on a number of occasions been penalised by the Conference Lines by having their goods tendered for shipment refused, even though the ship had sailed not full—practically refused on the ground of what is technically called disloyalty. Lord Inchcape was before us giving evidence, and we put this point to him, and he, with great emphasis, said that no line he was connected with would do such a thing. We came to the conclusion that it had been done, but that in all probability it had been done by the zealous action of subordinates, and therefore I was authorised by the Committee to communicate with Lord Inchcape, calling his attention to the evidence which he had given, informing him that it was our intention to examine any case of such boycotting that in future came before us, and asking him whether he could enlist the assistance of the Australian and New Zealand Conferences in the event of our having to make such an inquiry.

Lord Inchcape called meetings of the two Conferences and replied that the Conferences would give us assistance, and the result was that we were able to report to Mr. Hughes, then Prime Minister in Australia, in our interim report, that should such a case occur again we would investigate it and that we had been promised the help of the shipping lines themselves. From that day to this no such case has been brought to our attention.

We were then free to go on to consider the main question of rebates, which are illegal, of course, in various portions of the Empire, and which, in the main, affect only the outward trade from this country to other portions of the Empire. The Committee came to the unanimous conclusion that in the case of liners—and this matter does not touch tramps—a quasi-monopoly was essential to the maintenance of a permanent and healthy service.

From its very nature, no traffic on the ocean can have a physical monopoly. A shipping line must put steamers on the berth regularly, and must sail at the advertised date, full or empty. It is quite obvious, therefore, that the whole year's business must be the economic unit of liner business. If that is not so, then at the time of harvest the tramps will come in, will take the cream of the business, and will leave the liners to deal with the slack season. On such a basis, no liner company can possibly survive in the long run, and, therefore, the conclusion was reached that a certain quasi-monopoly was essential, and that, given the fluid conditions of the ocean and the unity of the ocean, that could only be arrived at by some tie of some description between the shipper who wished to ship parcels at any time by the liners, and the owners of the line. Now, may I say at once that as between the North Atlantic and all the rest of the ocean there is a great distinction to be drawn. In the case of the North Atlantic your shipping is plying between two vast communities, and both of them wealthy communities. Take the United States and Canada, on the one side, with 120 million people, and Europe, on the other side, with 300 or 400 million people. Many things could be done on the North Atlantic which cannot be done in the rest of the world, and what I am now saying would be subject to very considerable exceptions if you were thinking of the North Atlantic.

As regards the rest of the world, we arrived at the conclusion that a certain tie—it is technically called of loyalty—was essential between the shipping line and the shipping communities which it served. But the deferred rebate was not the only possible tie, and we had brought to our notice a practice which had recently arisen in South Africa. There the granting of a deferred rebate has for some time past been made illegal, but a tie had been established between the merchant community and the producing community and the shipping lines by means of an agreement. Instead of having the promise of a rebate to be paid after a certain period of deferment provided you are loyal in the meantime, there was substituted an agreement whereby a contract is signed to remain loyal to the companies and to ship, with certain exceptions, with the companies belonging to the Conference under the penalty of liquidated damages. So that there are two possible sanctions for loyalty. On the one hand is the promise of a rebate which you will forfeit if you are not loyal; on the other hand is the payment of damages if you fail to act up to your agreement to be loyal. We took careful evidence in regard to the South African practice, and we finally came to the conclusion that in view especially of the nugatory character of the recommendations of the Royal Commission, we would recommend the experiment of allowing an option, so that on a given trade shippers would have an option of whether they would commit themselves to the liner service which was catering for them by an agreement or by the system of deferred rebates. Our report was drawn up unanimously and was dispatched to the Prime Ministers. We allow normally six weeks in order that the report may reach New Zealand, but during that period I found that the Commonwealth Government Line had suddenly cut down its rates, and that it was expected that the Conference Lines would reply with a still more drastic cut; in other words, we were probably in for a rate war. This was most undesirable. I therefore at once asked the two parties if they would meet me, and when they met I found that the issue between them was in regard to the detailed application to the Australian trade of the general principles that we had come to. My hope was to get a truce, and I trusted that if I could get a truce the publication of our report would put such public pressure on the two interests that such a rate war would be impossible. Finally we achieved not a truce but a peace. A letter has been addressed to me by Sir Kenneth Anderson, the Chairman of the Orient Line on behalf of the Conference Lines, and Mr. Eva, who is the representative in London of the Commonwealth Line.

"DEAR SIR HALFORD,

"In reply to the question you have addressed to us, we are glad to say that the optional system of rebate or agreement, evolved in the Australian trade as a result of the inquiry by the Imperial Shipping Committee into the rebate system, is working satisfactorily. The form or agreement as originally introduced has already been signed by over 800 firms, and now that certain amendments are about to be made to meet the wishes of the Merchants' Association, and the document, subject to these, has been formally approved by them, it may be anticipated that the number of firms adopting the agreement alternative will be increased.

"Yours sincerely,
(Signed) "KENNETH S. ANDERSON.
"E. A. EVA."

There are about 1,500 firms shipping in this trade, I understand, so that already more than half of them have agreed to abandon the rebates and to accept the agreement, and since a further number are likely now to come in—the amendments have been adopted only within the last few days—I think it probable that at least three-quarters of the trade will have availed themselves of the offer which we induced the two interests to put before them. A number of other smaller questions were brought before us of the same character, dealing, that is to say, with complaints. The shipowners' first little grievance was that there was great delay in the bunkering of ships in Calcutta. We were able to make representations, and I understand that things are better. Then certain shippers of rice from Rangoon came to us on the ground that the ship-owning agents in Rangoon, being also concerned in the merchanting of rice, were discriminating against certain rice merchants.

We made certain representations there which I believe had some effect. In East Africa the merchants had some differences with the lines serving the East Coast of Africa, and as Chairman of the Committee I met a conference representative of the various interests, and it soon became apparent that we were dealing with a chaotic condition of things, that the shippers in East Africa had no sort of association, and I took it upon myself to tell them that until they had formed an association they did not deserve to carry weight with the shipping companies. I understand that an association has been formed and has been in negotiation with the shipping lines. In the case of certain of the West Indies, we were appealed to to obtain reductions of freight, and I am glad to say that in certain cases we were able to induce the shipowners to listen to the complaint; in other cases we were not able to effect a reduction, but a full statement of the reasons why it could not be done was communicated to the commercial units concerned. The most important of these minor cases concerns New Zealand. The New Zealand Government sent to us the finding of a Select Committee of the New Zealand Parliament in regard to the freights charged for cargo on the voyage from New Zealand to this country. We went into this question, and we made a report to the New Zealand Government. We came to the conclusion that as regards the six months that we investigated, under all the circumstances holding after the war, we could not find that the charges had been excessive, but we took the opportunity to point out some of the reasons why high freights have had to be charged on the homeward voyage, in the case especially of New Zealand, and in a less degree some other countries.

Perhaps I may spend just one moment on that matter, because it clears up a good many others. As regards tramp economics the round voyage must be the unit. Unless a tramp can obtain a cargo outward she cannot give favourable terms for cargo homeward. In the case of the liner it also holds, but with the further addition that there you have to consider good seasons and bad seasons, because the liner must sail full or empty, and therefore the round voyages of the whole year must be taken into account. Not only must you have cargo to carry both ways but you must also have terminal charges reduced to the lowest. I have received from the Chamber of Shipping a series of three resolutions with regard to high port charges, light dues, pilotage, and quarantine expenses at the Australian ports, with regard to light dues levied by State Governments in Australia as distinct from the Federal Government, and with regard to light dues in New Zealand. The questions are of an intricate character, and I am going to throw out a suggestion that perhaps Mr. Bruce himself would like to meet some representatives of the Chamber of Shipping, and perhaps Mr. Massey would do the same thing with regard to New Zealand. There are, of course, other matters which have to be borne in mind. Emigration bears a very important relation to the cost of the round voyage. Migrants, settlers, take the place of cargo. Then comes the question of coasting voyages. Now obviously no Imperial Committee is a suitable body even to investigate such a question as coasting voyages which belong to the jurisdiction of the different portions of the Empire and, therefore, I have merely got to point out that if regulations are adopted which have the effect of excluding ocean shipping more or less completely from the coasting traffic, that means, of course, that the ships are not earning on the round voyage all that they could earn. They are going partially empty, it may be, through a certain portion of the voyage, and therefore the cost of the voyage has to be spread over the remainder of the journey.

Lastly, there is the high cost of certain ports. On that point I would venture to quote the report which is going to be issued to the Prime Ministers. It was adopted by the Imperial Shipping Committee and is going to be issued as soon as it can be printed. I would venture to quote one paragraph from that:

> "It has been pointed out to us that where a percentage charge by way of tax is made upon the freight and fares from a given port, that charge becomes almost inevitably a part of the port charges, which charges are always taken into account by a shipowner when comparing the competitive value of the various freights open to him."

The question being, shall I send my ship to this port or to that port.

> "Such a tax may in fact act as a repellent reducing the amount of tonnage offering at a given port as compared with other ports, and thus placing the producers who ship through that port at a disadvantage with other producers in the world market."

I have gone into that matter at some little length because almost all these complaints in regard to the homeward voyage to the United Kingdom involve the matter of high freights. We are convinced broadly, and apart from particular cases, that in the present state of the shipping world, when you have some ten million tons of shipping laid up, it is the cost of the service and not the question of monopoly which is the governing factor, particularly in regard to the freights charged. I do not say that that would always be so and under all conditions, but in the present situation it is so.

Now I turn to the other side of the question. We have to consider how we can better the services within the Empire as well as remove sources of friction. Mr. Hughes, at the last Imperial Conference, brought that matter very urgently before me in the discussion that took place and I asked him whether he would send me an official Australian request for us to investigate the question which he had raised, namely, the subsidy necessary in order to give Australia a faster service of steamers.

He agreed; with the result that we received a request from the Australian Government. We went into that matter and we have presented a report to the Australian Government which has also been circulated to the other Prime Ministers of the Empire. We came to the conclusion that we could not give a specific answer to the question which was addressed to us. Things are still too much in a state of flux in the shipping world for it to be possible to give any precise estimate in regard to a subsidy which would remain true over any perceptible time, and apart from that, any such subsidy would be a matter of bargain. But we could give a general indication of the kind of subsidy that would be necessary. We came to the conclusion that the very big ship which had been so often suggested was not the solution. The Dominions Royal Commission recommended that very big ships should be built which could carry large quantities of cargo cheaply, but unless large quantities of cargo are forthcoming within a very short time the very big ship would spend most of her time in port waiting for the cargo to accumulate.

We were driven to the conclusion that the present position was necessarily unsatisfactory and that nothing but a very large subsidy would give you a satisfactory service to Australia which was wholly a shipping service. There are but a limited number of first-class passengers available for the steamers on that trade, and unless you are to charge a prohibitive fare for the voyage you must have a very heavy subsidy if you are to have a ship specialised for passengers; but if she is to carry passengers and cargo, she must not carry cargo at a prohibitive rate. No satisfactory compromise is possible, and we came to the conclusion that, in the present financial condition of the world, it was extremely unlikely that the Governments of the British Empire would pay such a subsidy as would pay for the building of purely passenger ships and would guarantee to their owners a long term of use.

We came to the conclusion that the only way in which you could hope to carry passengers and mails rapidly within the next generation from certain portions of the Empire to the central parts of the world, would be by a combination of air, sea, and land, and we have proposed a system whereby a week would be saved in the carriage of mails and first-class passengers between London, on the one hand, and Melbourne and Sydney on the other. You are to save four days by airship from this country to Egypt; two days on the Indian Ocean by speeding up the steamships on that ocean; and one day by saving a certain amount of time at Freemantle and perhaps a little on the trans-continental journey. There may be technical difficulties to be got over, but on technical matters we should not presume to express an opinion. The British Government have accepted the portion of the report which refers to airships, and I understand that, subject to endorsal and perhaps to negotiations in this conference, the endeavour will be made to supply that service at no distant date. Shipping companies on the Indian Ocean have already shown what they can do in hastening up their steamers, and I venture to say on behalf of the Committee that we hope it will be considered that we have done a more practical thing in trying to save a week in that way than by suggesting to you what was originally put to us, namely, that you should pay a subsidy sufficient to give you a service of steamers comparable with the service of steamers which you find on the North Atlantic. [Upon the conclusion of this speech the Conference adjourned.]

[The Conference was resumed on October 17.] The Hon. G. P. Graham, Minister of Railways and Canals, Canada, speaking first, said: The report is very interesting and I join with you all in saying how much we are indebted to Sir Halford Mackinder for it. It is true that the larger things in it refer mostly to Australia and New Zealand, but that does not make it any the less interesting to other Dominions so far as the general principles are concerned. The aftermath of the war seems to be reacting against the shipping business perhaps more severely than any other, because it can only depend upon commerce and plenty of it. Notwithstanding the fact that it is not prosperous, the rates are considered by the shippers too high, and the great difficulty is in straightening out this divergence of views without altogether ruining the shipping business. The Chairman of the Imperial Shipping Committee has rightly said that you cannot get reasonable rates, much less cheap rates, unless you have a cargo both ways; so that, as he remarked, the success of shipping depends, as the solution of nearly all our other troubles depends, upon the development of the outposts of the British Empire, so that we shall be able to have cargoes not only one way but both ways. With us it is just the reverse of the situation commented upon by Sir Halford. We can get a cargo to Liverpool, but we fail to get a full cargo back. Consequently, we are in difficulty a good deal of the time.

This question of the economic defence of shipping by enacting laws affecting the shipping of other countries is a delicate question to handle. For example, we have on the Great Lakes in Canada shipping of our own and tonnage of the United States. Now this season we came dangerously near being in a dilemma over the movement of our grain across the Lakes toward Europe on account of regulations that the Government had made under an Act passed for the purpose of protecting the producers against a shipping combine supposed to exist on the Great Lakes. The United States shipowners immediately said, "We will not comply with these; we will withdraw our boats and we will not carry your grain." It it had not been for the fact that certain arrangements were made by which they agreed to assist in carrying our wheat across the Great Lakes from the producer toward the consumer, we should have been in a dilemma which would have affected not only the producer in Canada but would have affected the supply in Great Britain of the wheat which she gets from Canada. So that if we were to adopt a policy such as that hinted at it might mean the possibility of injuring us in Canada as far as our carrying trade on the Great Lakes is concerned, because it has been rightly said that you can control a railway with its rates because it has to go from one point to another point in a certain restricted space and it cannot go anywhere else; but a ship can run between Boston and Liverpool one week, and the owner can take it somewhere else the next week. So that I would point out that it is a very delicate thing to deal with and I would not want to go very far unless I knew the direction in which we were pointing.

Sir Halford has mentioned the question of loyalty; that is "loyalty" in its technical sense, as referring to shipping. In broad terms that is loyalty to the company that is doing your carrying business; it is not fair to give one person the lean end and give some other person the remunerative part of your business. The reverse strikes us in Canada, and we had a Parliamentary investigation last session. The Canadian Merchant Marine was condemned because its manager, or one of its representatives, discussed with representatives of other companies the best means of carrying on the shipping business. We were at the reverse end of this principle in that our people were objecting to the Government-owned Transportation Company having any dealings with the shipping companies at home. I have rather taken the view, that when a Government goes into a pure business venture, it must do so as other people in the same business, or it is not competent to carry on the business. However, I want to point out the difficulties that might arise if we attempt to apply that principle of shipping loyalty in our country. We have that question of bill of lading. That is a difficult situation possibly, but I understood that it had been tentatively suggested that the principle underlying the Statute of the Dominion of Canada would be applied. Now, I am not sure whether this new proposed bill follows along the lines of the Canadian Act or has departed from it to such an extent that it might make it a little serious.

Sir H. MACKINDER: In essence it follows it.

CHAIRMAN: You may take it that practically any differences there are are so small as to be quite, I think, immaterial. What I would suggest we should do is that we could appoint a small select committee to go into the Rules, as they have come now from Brussels in their final form. There are no material differences in the Bill from the report of the Select Committee, and I think we could easily satisfy every member of the Conference that there is so little difference between that and the bases of the Act and the actual terms of the Canadian Act, and that they also fully carry out the recommendations of the Imperial Shipping Committee, that we should be prepared to take them.

Mr. GRAHAM: Would this be international?

CHAIRMAN: Yes, certainly.

Mr. GRAHAM: I have to come back to what we do not always like. It is necessary to have the same conditions between Great Britain and New York as exist between Great Britain and Canada.

CHAIRMAN: Yes, but it is bringing the world into line with what already is your law.

Mr. GRAHAM: That is what we want to know; if the world has been wrong and we are right and it is coming round, that is pleasing as well as important information. With reference to the harbour dues and charges, we have expended vast sums upon developing the harbours of Montreal and Quebec on the St. Lawrence, Halifax and St. John on the Atlantic, as well as internal harbours, and at the present moment are developing the Vancouver Harbour on the Pacific. Prince Rupert—one of the finest natural harbours in the world—is yet to be developed. It may be of interest, but I do not want to detain the Conference long, to point out that a new sea path from Canada to the British Isles has been opened up since the opening of the Panama Canal, and traffic in farm products, particularly wheat, is starting from a certain dividing line in Western Canada towards Vancouver and the Pacific where it originally went to Montreal and Quebec, and Halifax and St. John on the Atlantic. This year there have been shipped through the Vancouver port something over twenty million bushels of wheat. The Federal Government loans the money for these on which the Harbour Commissioners pay interest: so it may be that you will have to approach that question of restriction, which Sir Halford raised, with a little caution lest it might result in slowing up the development in these harbours which has been very extensive, but which we hope will repay in increased Empire traffic in addition to the international traffic.

Now I come to just two things which are of great interest to us. In the first place—this applies to ships registered in Great Britain—a cheaper rate is given on flour, for example, from New York than from our Canadian port of Montreal. That was a question which was thrashed out largely in a Committee of Parliament last session. I only yesterday received a complaint from the millers of the Dominion of Canada that the Canadian shippers are being discriminated against this way. They can send their flour to New York by rail over an American railway and get a cheaper rate from New York than they can from Montreal. As a result, the Canadian miller in shipping from Montreal is under a handicap, and if he ships *viâ* New York, not to be under a handicap, he injures the Canadian railways. There should be some possible way by which at least those within the Empire get as favourable a rate from their own ports as from the ports of a foreign country.

It might be argued that if the Americans were giving a cheaper rate on American flour only than was given Canadian flour from Canadian ports, it would be in defence of their own milling industry, but they carry Canadian flour from their own ports at a cheaper rate than from Canadian ports.

CHAIRMAN: Are you able to say, Mr. Graham, whether these lower American rates, the New York rates, were brought in by the United States lines and that our lines had to conform in order to get the trade? It may well be, without the slightest desire to discriminate against Canada, that the United States with all their subsidies, their Shipping Board, etc., had proceeded to cut the rates and had quoted those rates, and our shipowners would have to quote the same rates as the American lines or go out of business altogether.

Mr. GRAHAM: It is not new. If it were of a few days' growth that might be the case; but this very thing was investigated last year. It seems to be chronic.

CHAIRMAN: Yes, but the fault may lie in the fact that the United States backing their shipping lines with subsidies and so on, the United States lines have quoted these rates and that anybody else who wants to get any carrying trade there has to conform to them. We could go into that.

Mr. GRAHAM: It is a matter for investigation. The other question of great importance to us is the matter of insurance on the St. Lawrence route. The Canadian route is discriminated against on account of extra insurance imposed on traffic going through the St. Lawrence. We maintain that that is altogether unjust and the Canadian Federal Government has spent very large sums in making the channel safe through to Montreal. It has the depth, and is well lighted, and we want to urge as strongly as possible that the rates against traffic from the Dominion of Canada, as compared with the insurance rates from New York and other America ports, are altogether unjust. In fact, we have come to the point in Canada—this is not a threat at all, but just a statement of the plain situation—that if these insurance rates cannot be adjusted we are inclined to form a company of our own to carry the marine insurance now carried by other organisations. In the merchant marine, I might say in evidence of our faith in the channel, we carry no insurance whatever. We adopted the policy last year after investigation over a period of years, that the amount of insurance paid on the vessels themselves (I am not speaking of the cargo now) has so far exceeded the amount it has cost to carry the insurance that it is a splendid investment for the Canadian National Railway and the Canadian Government to carry the insurance themselves, and that is being done.

Sir HALFORD MACKINDER: That would be the case with a certain number of the great shipping companies here; they insure their own vessels.

Mr. GRAHAM: These ships ply the St. Lawrence route, many of them, and we consider the insurance rates imposed on the traffic through that route altogether out of proportion to the amount required to carry them and leave a good margin of profit. I hope to be able, or some representative of the Canadian Government, to call upon these Insurance Companies here and discuss the matter, but I thought it was important to inter-Empire traffic that these two things should be brought up and that the members of the Conference might be conversant with some of the difficulties we have in shipping. [The Conference adjourned.]

The Right Hon. W. F. MASSEY, Prime Minister of New Zealand, at the resumption of the Conference on October 18, made the following statement: It is quite evident now that British citizens on all sides of the world are beginning to realise that as the ocean is our national highway—and it is undoubtedly—it is just as important that we should make the best use of it as we do in connection with our railways and roads. We must do the best we can so far as the ocean highway is concerned by providing and getting the best means of sea communication that are possible, because there is no question that improved shipping services and reasonable freights go a long way towards promoting the prosperity of the countries concerned.

Our prosperity in New Zealand depends upon our getting shipped the primary products for which New Zealand is so justly noted. I was very glad to hear the very considerable improvement that has been made in the somewhat difficult question of bills of lading and rebates. I know that the question of rebates, as they stood for a long time past, caused very strong feeling in New Zealand, and if the agreements which appear to be taking the place of the rebates work satisfactorily—as I hope they will—then I think we have heard the last of the trouble with regard to rebates for some time to come. Time after time I was approached with a request that the Government should take action; but it is a very difficult thing to do, and I do not know that we could have done much that would be satisfactory either to shippers or to shipowners. The Shipping Committee seems to have found a solution of the difficulty, and I congratulate them thereon.

Now, one of our difficulties—and I am still thinking of freights, and it is extraordinary that it should be so—is that nature has been particularly generous to New Zealand in the way of providing harbours. The coasts of both Islands are indented with harbours, and even where the population is sparse, good harbours are to be found. Now, that raises this difficulty. Where these settlers are producing mutton and wool, say, they produce a few thousand carcases of mutton or lamb, as the case may be, or a few hundred bales of wool, they insist upon the large steamers coming into their port to lift their meat and wool. That is very convenient to these settlers, and indeed it would be an awkward proposal to say the ships should not call if they are willing to do so; but in actual practice a great deal of time is lost. The time of these big ships of twelve thousand tons is estimated at three or four hundred pounds a day. It means, therefore, that the settlers or the people in more closely settled parts of New Zealand have, under existing circumstances, to pay, in the form of higher freights, for the time occupied by the ships in travelling round the coast. It is a difficult question, and, as far as New Zealand is concerned, I am afraid it is getting worse, because we have many of these small harbours—which are being improved at the present time. Although I mention the difficulty I am not quite sure what the remedy is.

I believe that the reduction of freights to exporters from New Zealand has not been less than £1,000,000 per annum during the last 12 or 18 months. That means that the price they receive for their products is increased by that amount. There is a little more to be done in this connection. I ought to mention here that a very successful organisation has been established in New Zealand itself, part of whose business it is to look after the freights—I am now speaking of the Meat Export Control Board. That Board has been in existence, I think, for about two years, and in quite a number of directions it has done good work. I do not say it is responsible for all that I have mentioned in regard to the reduction in freights; I only say they have given material assistance, and I have no doubt but that the work of the Shipping Committee was beneficial so far as that aspect of the question was concerned. On the whole, our shipping service is satisfactory. We do not expect it to be perfect, and we know that shipping, as a whole, is passing through what may be called a transition stage. We cannot go the length of asking the shipowners to scrap the ships they at present use, because we know perfectly well that the users of the ships would have to pay for them by increased freights, or something of that sort. But gradually a new type of ship is being adopted—a new type of ship with Diesel engines which will be able to travel probably on the average faster than the ships which are in use now, and also carry more cargo. The internal combustion engine is taking the place of the ordinary engine, and so far as they have gone they have been quite successful. At all events, New Zealand shipowners are proving their faith by having ships built with Diesel engines. I know it will be an improvement, but we dare not ask them to scrap the other types and adopt a new type for some considerable time to come.

Now, as to the carriage of passengers and mails, I shall be very glad when it is found possible to speed up the connections. I am still somewhat sceptical about the airship. The doubt in my mind is whether it is possible to build the lighter-than-air machine strong enough to withstand the storms which must be met with in different parts of the world. I understand that we are to have an opportunity of discussing the aerial transportation of mails, passengers, and even cargo, and I shall be very glad to hear what is being done. We have long had a great deal of difficulty about the time taken in carrying mails; but we think we are justified in asking that they should be delivered in the shortest time possible between the two countries. If steamers can carry passengers between New Zealand and England in twenty-seven and a half days, they can surely carry mails in the same time, and that is all that we are asking for; and I should be very glad if the Shipping Committee would see its way to look into this matter for us. I know there is a fast ship being built which will carry mails by the Vancouver route to this country, and this will also bring about a corresponding improvement in the San Francisco service. But fast-steamer services are not of much avail unless terminal connections are carefully watched. I am afraid we became careless during the war, but we want to get back to normal as soon as we can, and it is the one direction in which we have not made the progress that we ought to have done in our country. Just a word about income tax. I do not think we have had the same trouble in regard to this in New Zealand as they have had in Australia and in Britain itself. The principle that I would like to go upon is that the income will pay taxation where it is earned. I know it is difficult of application—but, as I have said, we have very little difficulty in New Zealand. I know that difficulties have taken place in other countries, and if they go upon the principle of arriving at a mutual understanding about the percentage that ought to be charged or payable in income tax, many of these difficulties would, I think, disappear.

There is another point which has occurred to me since dealing with the Report which is under discussion. I think it would be desirable to consider whether it would not be possible to give this Committee, in whom we have all confidence, more power than they possess at present. When we set up a Parliamentary Committee we always give them power to call for persons and papers. Would it not be possible to give the Shipping Committee the same power? I think it ought to be considered by the Government—possibly it means legislation—as to whether the Shipping Committee should not be given the power to call for persons and papers when such papers are required for the public good.

CHAIRMAN: It is a matter, Mr. Massey, which we have considered carefully and I have discussed it with Sir Halford, and when he replies he will deal with it.

Mr. MASSEY: I shall be very glad to hear his opinion, because I have not had the opportunity of consulting the Chairman, but I want to express my gratitude to the Committee for what they have done, which seems to me only an earnest of what they will be able to do in the future, and I hope they will continue the good work which has been so well and auspiciously commenced. [The Conference adjourned.]

The Rt. Hon. S. M. BRUCE, Prime Minister of Australia, speaking at the next meeting of the Conference on Thursday, October 18, said: I think we must come to the conclusion that this Committee has rendered very great service to Britain and all the Dominions. As far as Australia is concerned, I desire to express our very great appreciation of the work they have done and the manner in which they have carried out the duties that were allotted to them. The question of shipping is, of course, quite vital to the whole Empire, and it is particularly vital to Australia because we are so far away from the markets in which we have to dispose of the greater part of our production. Personally I am satisfied that we should be well advised if we decided that it was in the best interests of the whole Empire that the Shipping Committee should be continued and placed on a permanent basis; but I will say a few words about that at a later stage. With regard to the work that the Committee has accomplished, the first question dealt with was that of bills of lading. None of us who have had any commercial experience at all, can have any doubt as to the great benefits that will result if, as appears now to be almost certain, an international basis for bills of lading is adopted. The question has been a very burning one for many years, and it became particularly acute during the period of the war. There are two aspects of it, of course. There is the point of view that if you have varying terms in bills of lading, that is only another way of promoting competition between the different shipping agents. There is also the point of view of the shipper that his interests have to be safeguarded. Most of us remember the struggle that went on as to the shipping companies' liability and the amount at which that liability was to stand, and the more or less satisfactory conclusion that was arrived at after a good deal of negotiation.

The next point was the question of deferred rebates. The position was a very difficult one, and the Commonwealth Government Line was to a certain extent instrumental in bringing this whole question under notice. I think it is very satisfactory that, as a result of the efforts of the Shipping Committee, the trouble, which at one time was very acute, has been settled. If there were war between two great forces such as the Commonwealth Line and the other shipping lines, the position would be very detrimental to the interests of the shippers themselves; but it is very difficult to make a fact like that clear to the people generally in any country. In Australia we have exactly the same feeling as Mr. Graham indicated exists in Canada. There are grave suspicions about any arrangements arrived at between shippers, and there is always an idea that such arrangements will operate very detrimentally to the interests of shippers by the different lines. If there had been no Shipping Committee, and this matter had been settled without an exhaustive examination of the position by a body that really carried weight in the Dominions, I am afraid we never should have been able to allay the suspicion in the minds of the people; but with this very authoritative pronouncement from the Shipping Committee I am confident that that suspicion will disappear, and we shall not be forced into a position in which no arrangements could possibly be permitted—a position which would have resulted in very serious detriment to the interests of those who have to ship. The whole question of getting cheap freights is one of the greatest possible interest to Australia. It is very difficult to make the people of Australia understand that cheap freights are dependent to a great extent upon the possibility of running ship services on a profitable basis, but it is also very difficult to make them understand that an arrangement between shipping companies may possibly have the result of giving them an improved service and cheaper freights. I think the Shipping Committee has done a great deal to assist us in bringing that fact home to the people in Australia, and for that we are very grateful to them.

Another question which they have considered is that of the freight charges in respect of New Zealand in particular; that was the route upon which the inquiry took place. It is inevitable that in a country which is so dependent upon freights, and which is conscious that there is some combination between shipowners, there will be a suspicion that freights are unduly high, and that the people generally are being exploited. A body such as this Shipping Committee, to which a question of that character can be referred, and which will deal with it in an exhaustive manner, make the whole position known, and give their conclusions, will do a great deal to help in allaying those suspicions.

I do not want, in connection with deferred rebates, to go into the subject of the advisability of Governments running shipping lines—I think that is rather outside the consideration of this Committee—and I leave the rebate question, merely saying that Australia is very glad that this long-standing trouble has been settled, and particularly glad that the settlement has the force of the opinion of the Shipping Committee, with its impartial view, behind it. I am sure that, having that, the position will be accepted much more readily in Australia than it otherwise would have been.

The other points raised were with regard to certain factors which may add to the cost of freights in Australia—in particular, the question of port charges was raised. That question is one to which we have also given very serious consideration. The shipping companies issued a Memorandum setting out the port charges in Australia, comparing them with the charges in other ports of the world, and dealing with specific items, such as lighterage, light dues, pilotage, and other handling charges, in the different ports. In May of the present year we had a Conference between the Commonwealth and all the States, at which the States were represented by their Premiers, and this question was raised by the Commonwealth. We set out the whole position in an exhaustive Memorandum, and at the Conference the matter was considered and certain definite conclusions were arrived at. The most important of those conclusions is one that I will read to you. I personally was speaking, and I dealt with several questions that had to be considered, including coast lights, and I said this:—

> "Can we subscribe to the principle—which the Commonwealth is prepared to do—that a profit should not be made out of harbour charges, naturally affecting freights which, as I have stated, are a most important matter to Australia? If revenue has to be raised, it is very desirable that it should be derived from some other source."

To that proposal all the States assented, so that we have now got to a point which I think is very important, that every one of the Governments in Australia have subscribed to the proposition that revenue should not be derived from this particular source, and the charges in our ports should be limited to the pure costs of providing the services which are required by shipping entering into our different harbours.

The main question, which was discussed at very great length, was with regard to the lights around the Australian coast. The position with regard to those lights is that up to 1916 they were the responsibility of the different States, but in that year the Commonwealth Government took over all the ocean lights and the States only retained the harbour lights. The proposal we made to them was that we should take over the whole of the lights so that there would be no justification or excuse left for the States charging any light dues at all. That, I think, will be agreed to, but it is not finally determined yet. It is important that something of that sort should be done, because although the States have been relieved of practically the whole of their responsibility in connection with lighting, they are in most cases still charging either the same amount as they used to when they were responsible for the whole of the lights, or a figure which is still quite substantial.

The present position with regard to this whole question of harbour charges in Australia is that the Commonwealth undertook to make an exhaustive investigation into the position and to make representations to the States, and it has done so, and made recommendations based on the broad principle that no revenue should be derived from that particular source, but that all charges should be limited to the costs of providing services. Sir Halford made a suggestion that perhaps it would be a good thing if I, or somebody else representing Australia, met the shipowners. I should be very glad indeed to do that, and I think it would be most appropriate if Sir Halford, as Chairman of the Committee, would be good enough to arrange the meeting.

As to the point that was raised in connection with the coastal trade in Australia, we have a Navigation Act of our own in which we lay down certain standards for ships trading around our coasts. The Navigation Act was passed by Australia with a view to trying to establish a Mercantile Marine of our own, and I am sure the First Lord of the Admiralty will agree with me that to have a Mercantile Marine of our own is very desirable. We have heard many complaints as to the provisions of our Navigation Act, but you must take it that Australia is quite determined that she will have a Navigation Act of her own, and try to create a Mercantile Marine of her own. However well designed any Act may be, there may be some things in it which do not really help to achieve the objects aimed at and may even be detrimental to them.

At the end of the last session of Parliament we appointed a Royal Commission, which is sitting at the present time, and which should report very soon after Parliament meets again in the New Year. The purpose of the Commission is to consider the whole incidence of the Navigation Act, and to report generally upon its effects on Australian trade; so that all these questions are very much under consideration at the present moment. The question of income tax was also dealt with, and we are prepared to discuss income tax or any other charge that increases our freights; but the question is not quite so simple of solution as has been suggested. Australia at the present moment has one principle in regard to income tax; and that is, that she collects income tax on all income derived within her borders; but we do not charge income tax on income derived outside. Britain, of course, takes a very different view. She follows for income tax purposes income earned anywhere, whether inside or outside her borders, provided it is the income of a person who is a British domiciled resident. Now there is no question but that part of these shipping profits is derived in Australia; and it would mean a complete departure from the basic underlying idea of our income tax rating if we agreed to abandon the taxation which we levy upon shipping in our ports. Still if it will achieve any real results, we are quite open to discuss any method of adjusting this matter between the governments concerned. But I ought to make it quite clear that at the present moment the Australian Government would be very reluctant to subscribe to the principle that, for example, British registered tonnage, which possibly is owned by a British registered company, should be freed from all taxation in Australia, although earning profits there, and that the British Government should solely collect that tax.

CHAIRMAN: Would that apply, Prime Minister, to the new proposal, which is that we should reciprocate and that we should collect tax on our companies, leaving yours free of taxation on profits earned here and graft on to the ordinary taxation the special exemption in the case of shipping by reason of its special difficulties?

Mr. BRUCE: We might be open to consider that; but. of course, a moment's reflection will show that it is an entirely one-sided bargain. If you look at the registered tonnage of British shipping, and then look at Australia's magnificent mercantile marine, and discuss it on the basis of a reciprocal arrangement, you will see there is a very large benefit in one direction and a small one in the other. I only mention that because we have to recognise the difficulty with which we are faced, and I also wish to make it quite clear that Australia's action, which is sometimes referred to as if it were a most improper and a most illogical one, is merely carrying out what is a quite proper principle of Income Tax Law.

CHAIRMAN: May I just say this? I think the criticism is perhaps a double one. It is the general inconvenience of subjecting shipping to taxation everywhere, but also that even if you admit the theory that you tax on the profits earned in a particular country you establish a wholly fictitious way of assessing what are the profits.

Mr. BRUCE: All I really want to say about this matter is that the principle we are following is not an unreasonable principle. We are perfectly prepared to consider whether there is any reciprocal arrangement we could come to in regard to it; but at the present moment we cannot quite see that shipping companies should come into our waters and derive profit there, without our getting any revenue at all from them. As to the suggestion that we take an arbitrary rule as to what the profits are, it is almost impossible to avoid doing something of that sort; but we are quite prepared to consider whether we are taking an unfairly high standard of profit in assessing companies. We have, I think, shown very recently that we are not taking up any unreasonable attitude on that point. We used to charge on the basis of 10 per cent. on the takings, but in the Income Tax Act of last session we have reduced that to 7½ per cent., and we are still open to consider whether that is too high or whether it is a fair basis. In regard to the past, I think that up to the time when the shipping slump occurred, the shipping companies have no very good grounds for any great objection to what we did. I have considerable sympathy for them as regards the period which followed after the shipping slump took place, but, over the whole period during which they have had to pay, I must say I do not think they have been very unfairly treated. I have explained the principle of the taxation, and, as to the amount, we are quite open to listen to any representations, our whole object being to try and ensure that we shall get for Australia the cheapest possible freight.

The only other point I want to deal with is what can be done in the way of bringing about any improvement. I do not think the importance of the Report which was made by the Committee, as a result of the direct request of the Australian Government, can possibly be exaggerated. It has been rather usual to draw pictures of our great distance from the markets we have to trade in, and to stress the importance of accelerated services. Nobody would, for one second, argue that that is not a very proper attitude to take up, but what you desire to achieve must be conditioned by what it is possible to do. This Report, with the great weight that it has behind it, will be of the greatest assistance in bringing home to the people of Australia exactly how far it is possible to go in this direction, and what it is quite out of the question to attempt to do. There are many factors concerned with it. The economic size of vessels, it has been pointed out, depends upon the cargoes that are offering; and I think the conclusion arrived at by the Committee is sound, that, as far as cargo and passengers are concerned, it is not so much a question of the speed, but the certainty and continuity of the service. But that point is dealt with in the fullest manner by the Report, and it does show that both as to size and as to speed it is necessary to consider whether it is economically possible either to build ships of a much larger size or greatly to increase their speed.

Personally, I agree entirely with what has been found by the Committee. The only thing that has left a doubt in my mind, is that after exhaustively reviewing the position and showing all that can be done—including an acceleration of the speed during the sea-passage part of the transit—we arrive at a position where the total time occupied is one day longer than used to be the original practice for making this journey. I have no doubt there is an explanation, but at the moment I am not very clear as to what it is.

I wish to deal with one other point with regard to that particular report. It is very useful to have it shown that as far as passengers, with very few exceptions, and cargoes are concerned, any expedition which could be achieved would certainly not compensate for the increased cost and the uneconomic basis of the service. It would not justify the enormous subsidies that would have to be paid by the Governments concerned.

With regard to mails, while they are not to-day as important as once they were, because we rely much more upon cable communication and wireless for all matters where great expedition is required, it is essential that we should have the most accelerated mail service that we can get. The suggestion is to accelerate the mail; and the greatest acceleration we bring about is by an air service between Egypt and Great Britain. No doubt that aspect will be considered when we are dealing with air communications.

The other matter that we have to consider is the question of the continuance of this Committee. I know that on a previous occasion Australia took the view that the matter should be further considered before any definite decision was come to, but I think that was to a great extent due to the fact that the Committee had yet to prove its real usefulness. I think it has now quite proved itself to be invaluable from the point of view of the Empire, and, on behalf of Australia, I am prepared to say that we desire this Committee to continue and to be placed upon a permanent basis.

The functions which it has to perform will, of course, depend upon circumstances as they arise. I think the past has shown the type of question that will require consideration: questions of freights throughout the Empire, and whether they are on a proper basis; there will be further questions as to services which should be established between different parts of the Empire; there will be questions similar to that which has been investigated, as to the time which is occupied in any service and what steps can be taken to accelerate it; there will always, inevitably, as the size of ships increases, be many questions with regard to harbour facilities, and so forth. On none of these questions will this Committee be in any sense dictating to the Government. It will merely be giving an authoritative opinion which should be of great value to the different Governments in forming their opinions upon matters that they have to decide. I believe there is an extraordinary amount of useful work that this Committee can do, particularly having regard to the fact of the paramount importance to the whole Empire of shipping communication and shipping facilities for our inter-Imperial trade, which we all hope will be very greatly extended in the years that are coming. Personally I think that this Committee should be continued, and that it will be a very valuable instrument if it continues the work that it is doing. I think, however, that it should be a truly Imperial body, and by that I mean that it should really be functioning under the Imperial Conference; that if it is put on a permanent basis, it should really be the creation of the Imperial Conference, and that its responsibility should be to the Imperial Conference and not to any individual Prime Minister, and certainly not to any individual department of any individual Government.

CHAIRMAN: Of course, it is responsible to all the Prime Ministers. Its whole form is that it reports certainly not to a head of an English Department; it reports to all the Prime Ministers equally.

Mr. BRUCE: I quite appreciate that, and I recognise that the reports are addressed individually to all the Prime Ministers concerned. But I raised the point to make it perfectly clear that the only basis upon which we would consider it was a right and proper thing to continue it permanently would be that it should be really an Imperial Committee which has its responsibility to the whole of the Prime Ministers or to the Imperial Conference and not to any individual part of the Empire.

THE RESOLUTIONS ON SHIPPING OF THE IMPERIAL CONFERENCE.

The following Resolutions were adopted at the concluding Meeting of the Conference held on October 23:—

"That this Conference is of opinion—

(1) that the work accomplished by the Imperial Shipping Committee is convincing proof of the wisdom of its establishment, and that it is of the highest importance to the Empire that this work should continue;

(2) that it is, therefore, desirable to maintain the Committee on its present basis, deriving authority from, and responsible to, the Governments represented in the Imperial Conference."

FLAG DISCRIMINATION.

"In view of the vital importance to the British Empire of safeguarding its overseas carrying trade against all forms of discrimination by foreign countries, whether open or disguised, the representatives of the Government of the Empire declare:

(1) That it is their established practice to make no discrimination between the flags of shipping using their ports, and that they have no intention of departing from this practice as regards countries which treat ocean-going shipping under the British flag on a footing of equality with their own national shipping.

(2) That in the event of danger arising in future to the overseas shipping of the Empire through an attempt by a foreign country to discriminate against the British flag, the Governments of the Empire will consult together as to the best means of meeting the situation."

"The Conference further recommends that the draft convention on the immunity of State-owned ships adopted by the meeting of the Maritime Law Committee of the International Law Association held at Gothenburg in August last, and amended after consultation between the British Admiralty and Board of Trade, should be adopted throughout the Empire as the basis on which an international convention might be concluded. This amended draft is as follows:—

"IMMUNITY OF STATE-OWNED SHIPS.

(*Amended Draft: October* 26, 1923.)

"Article 1.—Vessels owned or operated by States for Trading purposes, Cargoes owned by them and cargo and passengers carried on such vessels and the States owning or operating such vessels shall be subjected in respect of claims relating to the operation of such vessels or to such cargoes to the same rules of legal liability (*i.e.* liability to be sued for payment) and to the same obligations as those applicable to private vessels, persons or cargo.

"Article 2.—Such liabilities shall be enforceable by the tribunals having jurisdiction over and by the procedure applicable to a private-owned ship or cargo or the owner thereof.

"Article 3.—Ships of War, State Yachts, Surveying Vessels, Hospital Ships and other vessels owned or operated by States and employed on other than trading purposes shall continue to enjoy the respective privileges and immunities hitherto enjoyed by them by the comity of nations. Liabilities against such ships in respect of collisions or salvage claims shall, however, be enforceable, but only by action before the competent tribunals of the State owning or operating such vessels; and no such vessel shall be liable to arrest. Similarly, State-owned cargo carried for non-commercial purposes in ships owned or operated by the State shall not be subject to seizure, but shall be liable to process of Law, but only in the Courts of the State owning such vessels.

"Article 4.—The provisions of this Convention will be applied in every contracting State in all cases where the claimant is a citizen of one of the contracting States, provided always that nothing in this Convention shall prevent any of the contracting State from settling by its own laws the rights allowed to its own citizens before its own Courts.

"Article 5.—This Convention shall not be binding on a belligerent State in respect of claims arising during the period of belligerency."

BILLS OF LADING.

That the following Resolution be adopted:—

"This Imperial Economic Conference having examined the Rules relating to Bills of Lading recommended by the International Conference on Maritime Law held at Brussels in October, 1922, and embodied in the Carriage of Goods by Sea Bill now before the British Parliament, is of opinion that in all essential principles they are based upon the Canadian Water Carriage of Goods Act, 1910, and the Report of the Imperial Shipping Committee, 1921, and believing that there is a good prospect of international agreement in regard to bills of lading on this basis which would be of benefit to every part of the Empire, considers that these Rules can be recommended for adoption by the Governments and Parliaments of the Empire."

MERCHANT SHIPPING OF THE WORLD.

NUMBER AND TONNAGE OF MERCHANT VESSELS LAUNCHED.*

	1910.		1913.		1919.		1920.		1921		1922.	
	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.
Gt. Britain and Ireland	500	1,143,169	688	1,932,153	612	1,620,442	618	2,055,624	426	1,538,052	235	1,031,081
British Dominions	60	26,343	91	48,339	263	358,728	103	203,644	54	129,675	39	62,765
United States	195	331,318	205	276,448	1051	4,075,385	509	2,476,253	173	1,006,413	59	119,138
Austria-Hungary	8	14,304	17	61,757	—	—	—	—	—	—	—	—
Denmark	18	12,154	31	40,932	46	37,766	30	60,669	37	77,238	23	41,016
Holland	105	70,945	95	104,296	100	137,086	99	183,149	98	232,402	60	163,132
France	55	80,751	89	176,095	34	32,663	50	93,449	65	210,663	62	184,509
Germany	117	159,303	162	465,226	No returns.		No returns.		242	509,064	195	575,264
Italy	21	23,019	38	50,356	32	82,713	82	133,190	85	164,748	42	101,177
Japan	70	30,215	152	64,664	133	611,883	140	456,642	43	227,425	49	83,419
Norway	64	36,931	74	50,637	82	57,578	30	38,855	35	51,458	23	32,391
Russia	14	4,395	10	3,300	—	—	—	—	—	—	—	—
Spain	1	3,234	12	8,488	41	52,609	13	45,950	11	47,256	2	7,776
Sweden	17	8,904	25	18,524	53	50,971	46	63,823	27	65,911	14	30,038
Other Countries	32	12,868	61	31,667	36	26,725	39	50,418	81	81,374	49	35,378
World's Total	1277	1,957,853	1750	3,332,882	2483	7,144,549	1759	5,861,666	1377	4,341,679	852	2,467,084

* Figures given include all steamers and sailing vessels of 100 gross tons and upwards.

MERCHANT VESSELS UNDER CONSTRUCTION.*

	1910.		1913.		1919.		1920.		1921.		1922.	
	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.
Gt. Britain and Ireland .	363	1,131,503	513	1,956,606	757	2,994,249	921	3,708,916	515	2,640,319	315	1,468,599
British Dominions . . .	16	12,231	38	38,785	113	251,480	74	186,655	34	66,469	21	49.245
United States	59	96,289	66	147,597	647	2,966,515	235	1,310,312	43	216,428	37	139,448
Austria-Hungary . . .	13	38,320	16	63,300	—	—	—	—	—	—	—	—
Denmark	8	9,625	12	25,362	56	100,335	57	121,279	27	63,070	19	34,864
Holland	24	47,620	41	126,867	126	328,338	174	450,964	123	313,879	63	142,969
France	24	109,106	39	229,020	65	216,775	104	397,969	76	352,635	43	188,525
Germany	63	160,932	102	544,682	No returns.		No returns.		No returns.		109	416,081
Italy	6	15,505	23	53,809	125	314,547	159	363,784	122	393,832	65	211,499
Japan	28	33,058	14	47,797	64	309,474	59	248,513	35	144,912	30	93,831
Norway	27	20,920	49	42,614	61	92,719	59	83,928	40	61,559	28	40,946
Russia	—	—	1	5,620	—	—	—	—	—	—	—	—
Spain	1	3,838	3	6,855	28	107,463	27	89,340	16	69,937	16	50,617
Sweden	7	11,585	18	18,400	67	110,765	64	122,578	33	78,269	18	43,356
Other Countries	14	8,580	19	23,829	29	68,703	47	95,540	62	55,784	51	74,338
World's Total . .	653	1,699,112	954	3,331,143	2138	7,861,363	1980	7,179,778	1126	4,457,093	815	2,954,318

* The figures give the number and aggregate gross tonnage of steamers, motor ships, and sailing vessels under construction on December 31st of each year.

ANNUAL MERCHANT SHIPPING LOSSES OF THE WORLD.*

	1910.			1913.			1919.			1920.			1921.			1922.		
	No.	Tonnage.	% of Tonnage owned.	No.	Tonnage.	% of Tonnage owned.	No.	Tonnage.	% of Tonnage owned.	No.	Tonnage.	% of Tonnage owned.	No.	Tonnage.	% of Tonnage owned.	No.	Tonnage.	% of Tonnage owned.
Gt. Brit. & Ireland	129	222,069	1·27	113	199,453	1·07	99	151,653	·92	99	131,481	·72	74	72,104	·87	88	122,088	·63
British Dominions	44	27,858	1·86	37	20,091	1·16	89	52,539	2·56	64	29,022	1·39	82	58,687	2·35	43	20,602	·75
United States . .	75	50,996	1·82	91	71,469	2·38	115	150,272	1·15	108	159,694	1·16	72	107,145	·73	72	94,387	·64
Austria-Hungary .	2	3,210	·41	3	5,586	·55	—	—	—	—	—	—	—	—	—	—	—	—
Denmark . . .	11	9,506	1·29	13	6,583	·86	15	5,295	·75	22	6,646	·83	13	8,386	·87	9	8,281	·80
Holland . . .	4	8,121	·80	4	1,340	·10	23	11,550	·73	15	4,417	·25	2	602	·03	7	5,167	·20
France	31	20,789	1·10	30	34,506	1·57	34	40,420	1·81	40	63,866	1·97	39	37,956	1·04	38	38,204	·86
Germany . . .	39	44,233	1·02	31	56,379	1·11	50	24,167	—	19	10,280	1·53	22	11,265	1·57	33	27,408	1·45
Italy	17	18,534	1·40	26	26,881	1·77	8	3,096	·23	10	13,287	·59	27	33,090	1·25	27	33,908	1·18
Japan . . .	22	21,505	†	25	25,514	†	38	41,418	†	29	41,988	†	29†	51,185†	1·53†	64†	54,136†	1·51†
Norway . . .	78	67,971	3·37	61	60,648	2·47	41	44,132	2·37	42	52,648	2·37	27	46,829	1·81	29	27,068	1·04
Russia . . .	31	19,441	2·19	29	23,894	2·45	4	4,771	·88	7	15,529	2·91	—	—	—	—	—	—
Spain	15	17,599	2·30	13	15,928	1·89	16	9,752	1·30	18	14,826	1·49	35	55,560	4·77	25	29,741	2·30
Sweden	31	15,260	1·66	30	17,327	1·65	38	29,021	2·92	23	23,026	2·15	13	11,854	1·02	12	7,304	·65
Other Countries .	38	44,444	—	36	42,686	—	65	54,719	—	65	78,893	—	68	86,163	—	68	58,417	—
World's Total .	562	591,536	—	542	608,235	—	635	622,805		561	645,603	—	503	580,826	—	505	516,711	—

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* Figures refer to steam and sailing vessels of 100 gross tons and over totally lost, condemned, etc. The tonnage given is gross for steamers and net for sailing ships up to and including the returns for 1919; in subsequent returns the tonnage is gross for both steamers and sailing ships.

† Japanese sailing vessels not included.

LARGEST STEAMERS OF THE WORLD.

Gross Tonnage.	Name.	Speed (knots).	Built.	Flag.	Owners.	Registered Dimensions.* Length.	Breadth.	Depth.
						ft.	ft.	ft.
59,957	Leviathan (*ex*-Vaterland)	22	1914	United States	U.S. Shipping Board	907·6	100·3	58·2
56,551	Majestic (*ex*-Bismarck)	26	1921	British	White Star	915·5	100·1	58·2
52,226	Berengaria (*ex*-Imperator)	23	1912	British	Cunard	883·6	98·3	57·1
46,439	Olympic	23	1911	British	White Star	852·5	92·5	59·5
45,647	Aquitania	24	1914	British	Cunard	868·7	97·0	49·7
35,000	Columbus	—	1922	German	Norddeutscher Lloyd	750·0	83·0	48·9
34,569	Paris	22	1921	French	Cie. Gén. Transatlantique	735·4	85·3	59·1
34,356	Homeric (*ex*-Columbus)	18½	1922	British	White Star	751·0	83·3	48·6
30,696	Mauretania	27	1907	British	Cunard	762·2	88·0	57·1
27,132	Belgenland	18½	1917	British	International Nav. Co., Ltd.	670·4	78·4	44·7
25,037	Empress of Scotland (*ex*-Kaiserin Auguste Victoria)	17½	1905	British	Canadian Pacific Steamships, Ltd.	677·5	77·3	50·2
25,000	Caracciolo	18	1921	Italian	Nav. Gen. Italiana	—	—	—
24,541	Adriatic	18	1906	British	White Star	709·2	75·5	52·6
24,149	Rotterdam	17	1908	Dutch	Nederl. Amerik Stoomv. Maats	650·5	77·4	43·5
23,884	Baltic	17	1904	British	White Star	709·2	75·6	52·6
23,788	George Washington	18	1908	United States	U.S. Shipping Board	699·1	78·2	50·1
23,666	France	24	1912	French	Cie. Gén. Transatlantique	689·2	75·6	48·5
22,000	Albert Ballin	—	1922	German	Hamburg-Amerika Linie	602·5	79·0	51·6
22,000	Deutschland	—	1922	German	,, ,,	602·5	79·0	51·6
22,000	Duilio	18½	1917	Italian	Nav. Gen. Italiana	601·4	75·9	50·1
21,861	Empress of Australia (*ex*-Tirpitz)	17	1914	British	Canadian Pacific Steamships, Ltd.	589·9	75·2	41·5
21,716	Minnewaska	—	1923	British	Atlantic Transport Co., Ltd.	600·8	80·4	49·4
21,657	Giulio Cesare	19	1921	Italian	Nav. Gen. Italiana	602·4	76·5	46·3
21,517	Empress of Canada	18	1922	British	Canadian Pacific Steamships, Ltd.	627·0	77·9	42·2
21,144	America	17	1905	United States	U.S. Shipping Board	668·8	74·3	47·8
21,073	Cedric	17	1903	British	White Star	680·9	75·3	44·1
21,026	Celtic	17	1901	British	,, ,,	680·9	75·3	44·1
20,700	Maloja	17	1923	British	P. & O. Steam Navigation Co., Ltd.	600·8	73·4	48·6
20,700	Mooltan	17	1923	British	,, ,, ,,	600·8	73·4	31·6
20,602	Minnesota	13	1904	Not recorded	—	622·0	73·5	41·5
20,576	Cap Polonio	17	1914	German	Hamburg Sudamerikanische Damps. Ges	637·7	72·3	39·5
20,158	Franconia	16½	1923	British	Cunard	601·3	73·7	40·6
20,000	Orama	—	1923	British	Orient Steam Navigation Co., Ltd.	632·0	75·3	33·0

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* The registered dimensions are measured as follows: Length from fore part of stem under bowsprit to aft side of head of stern post; breadth is taken to outside of plating; depth from top of beam of tonnage deck to ceiling at midships. If there is no ceiling it is measured to the tank top. If there are more than two decks, the tonnage deck is the second deck, counting from below.

GENERAL PARTICULARS OF LARGE SHIPS OF VARIOUS NATIONALITIES.

Name of Ship	AQUITANIA.	MAURETANIA.	OLYMPIC.	LEVIATHAN (formerly Vaterland).	BERENGARIA (formerly Imperator).	MAJESTIC (formerly Bismarck).
Name of Builders	John Brown & Co., Ltd., Clydebank	Swan, Hunter & Wigham Richardson, Ltd., Wallsend-on-Tyne	Harland & Wolff, Ltd., Belfast	Blohm & Voss, Hamburg	Vulcan Co., Hamburg	Blohm & Voss, Hamburg.
Name of Owners or Managers	Cunard Co.	Cunard Co.	White Star Line	U.S. Shipping Board	Cunard Co.	White Star Line
Year when built	1914	1907	1911	1914	1912	1921
Length over all	901 ft. 6 ins.	790 ft.	883 ft.	950 ft.	905 ft.	956 ft.
Length between perpendiculars (or moulded)	865 ft.	760 ft.	850 ft.	—	880 ft.	912 ft.
Breadth	96 ft. 6 ins.	88 ft.	92 ft.	100 ft.	98 ft.	100 ft.
Depth (moulded)	64 ft. 6 ins.	60 ft. 6 ins.	64 ft. 3 ins.	63 ft.	62 ft.	64 ft.
Gross Tonnage	45,647	30,696	46,439	59,957	52,226	56,551
Draught	35 ft. 3¾ ins.	36 ft. 2¼ ins.	34 ft. 7 ins.	38 ft. 6 ins.	35 ft. 6 ins.	38 ft. 11¼ ins.
Displacement (tons)	51,700	41,590	—	63,100	57,000	64,000
Number of Passengers—						
First Class	597	602	817	672 †	700	1000
Second Class	614	430	510	535	600	545
Third Class	2000 (and 52 servants)	780	1216	2392 ‡	2690	2392
Machinery Makers	John Brown & Co., Ltd.	Wallsend Slipway and Engineering Co., Ltd.	Harland & Wolff, Ltd., Belfast	Blohm & Voss, Hamburg	Vulcan Co., Hamburg	Blohm & Voss, Hamburg
Type of Engines	Steam Turbines driving Four Screws	Steam Turbines driving Four Screws	Reciprocating with Turbine on Centre Shaft	Turbines	Steam Turbines driving Four Screws	Steam Turbines driving Four Screws
Number of Cranks	—	—	8	—	—	—
Diameters of Cylinders	—	—	Two 54 ins.; two 84 ins.; and four 97 ins.	—	—	—
Stroke of Pistons	—	—	75 ins.	—	—	—
Revolutions per Minute	180	200	Reciprocating engines, 77; Turbine, 165	180–190	185	180
Total Indicated or Shaft Horse-power	60,000	75,000	51,000	—	76,250	66,000
Number and Type of Boilers	21 Cylindrical (double ended)	25 Cylindrical (23 double-ended, 2 single-ended)	29 Cylindrical (24 double-ended, 5 single-ended)	46 Water Tube	46 Water Tube	48 Water Tube
Number of Furnaces	168 (now fitted for oil burning)	192 (now fitted for oil burning)	159 (now fitted for oil burning)	138	46 (oil-fired)	48 (oil-fired)
Steam Pressure (lb. per sq. in.)	195	195	215	235	235	260
Total Heating Surface (sq. ft.)	138,595	159,000	142,454	210,440	203,009	220,000
Total Grate Area (sq. ft.)	3541	4060	3428	3843	3763	4013
System of Draught	Howden's	Howden's	Natural	Howden's	Howden's	Forced
Speed on Service (knots)	24	25·5 *	23	21	23	23·5

* NOTE.—This figure is the mean speed attained for 27 consecutive runs across the North Atlantic in one year covering a total distance of 77,500 nautical miles. The highest mean speed from Queenstown to New York was 26·06 knots.

† 80 Berths for Servants and 110 Pullman Berths in addition.

‡ Including 1542 Fourth Class Passengers.

FASTEST STEAMERS OF THE WORLD.†

Speed (knots).	Name.	Gross Tonnage.	Date built.	Flag.	Owners.	L.* (ft.).	B.* (ft.).	D.* (ft.).
27	Mauretania	30,696	1907	British	Cunard	762·2	88·0	57·1
26	Majestic	56,551	1921	,,	White Star	915·5	100·1	58·2
25 and under 26	Paris	1,774	1913	,,	Southern Rly.	293·5	35·6	15·2
	Versailles	1,903	1919	French	Chemins de Fer de l'État Français and the Southern Rly.	300·6	34·6	21·4
24 and under 25.	Aquitania	45,647	1914	British	Cunard	868·7	97·0	49·7
	Anglia	3,460	1920	,,	London, Midland & Scottish Rly.	380·5	45·2	10·5
	Cambria	3,445	1921	,,	,,	380·6	45·2	17·2
	Hibernia	3,458	1920	,,	,,	380·6	45·2	17·2
	Scotia	3,441	1921	,,	,,	380·5	45·2	26·2
	Newhaven	1,656	1911	French	Chemins de Fer de l'État Français and the Southern Rly.	292·0	34·6	22·1
	Rouen	1,656	1912	,,		292·0	34·6	22·1
	France	23,666	1912	,,	Cie. Gén. Transatlantique	689·2	75·6	48·5
23 and under 24.	Maid of Orleans	2,071	1918	British	Southern Railway.	341·1	42·1	16·0
	Munster	2,646	1897	,,	City of Dublin Steam Packet Co.	360·0	41·5	27·3
	Olympic	46,439	1911	,,	White Star	852·5	92·5	59·5
	Ulster	2,641	1896	,,	City of Dublin Steam Packet Co.	360·0	41·5	27·5
	Viking	1,957	1905	,,	Isle of Man St. Packet Co.	350·4	42·0	16·1
	Berengaria	52,226	1912	,,	Cunard	883·6	98·3	57·1
	Biarritz	2,053	1915	,,	Southern Rly.	341·2	42·1	24·0
	H. F. Alexander	8,357	1915	U.S.	Admiral Line	509·5	63·1	21·0
22 and under 23.	Brighton	1,129	1903	British	Southern Rly.	273·6	34·2	14·1
	Dieppe	1,228	1905	,,	,,	273·5	34·8	13·8
	Empress	1,695	1907	,,	,,	311·3	40·1	15·8
	Engadine	1,676	1911	,,	,,	316·0	41·1	15·8
	Invicta	1,680	1905	,,	,,	311·2	40·1	15·8
	Manxman	2,091	1904	,,	Isle of Man St. Packet Co.	334·0	43·1	17·3
	Mona's Isle	1,671	1905	,,	,,	311·2	40·1	15·7
	Riviera	1,675	1911	,,	Southern Rly.	316·0	41·1	15·8
	Snaefell	1,713	1906	,,	Isle of Man St. Packet Co.	315·0	39·6	15·7
	St. Andrew	2,495	1908	,,	Fishguard and Rosslare Railways and Harbours Co.	351·1	41·1	16·5
	St. David	2,457	1906	,,	,,	350·8	41·1	16·5
	St. Patrick	2,456	1906	,,	,,	350·8	41·1	16·5
	Victoria	1,689	1907	,,	Southern Rly.	311·0	40·1	15·8
	Wahine	4,436	1913	,,	Union S.S. Co. of New Zealand, Ltd.	375·0	52·2	25·6
	Leviathan	59,957	1914	U.S.	U.S. Shipping Board	907·6	100·3	58·2
	Paris	34,569	1921	French	Cie. Gén. Transatlantique	735·4	85·3	59·1
	Mecklenburg	2,907	1922	Dutch	Stoomv. Maats. "Zeeland"	350·4	42·7	23·9
	Prinses Juliana	2,908	1920	,,	,,	350·4	42·7	23·9
	Oranje Nassau	2,885	1909	,,	,,	350·0	43·1	16·4
21 and under 22.	Arundel	1,068	1900	British	Southern Rly.	269·1	34·1	14·1
	King Orry	1,877	1913	,,	Isle of Man St. Packet Co.	300·0	43·1	15·9
	Princess Patricia	1,158	1902	,,	Canadian Pacific Rly. Co.	270·0	32·1	11·6
	La Savoie	11,168	1900	French	Cie. Gén. Transatlantique	563·1	60·0	35·9
	Esperia	11,346	1918	Italian	Soc. Italiana di Servizi Marittimi	492·1	61·7	34·1
	Venezia	988	1906	,,	D. Tripcovich	275·0	32·1	10·2
	Von Steuben	14,901	1901	U.S.	U.S. Shipping Board	637·1	66·3	39·3
20 and under 21.	Antwerp	2,957	1920	British	London and North Eastern Rly.	321·6	43·1	17·9
	Britannia	459	1896	,,	P. and A. Campbell, Ltd.	230·0	26·6	9·6
	Cambria	420	1895	,,	,,	225·0	26·1	9·4
	Curraghmore	1,587	1919	,,	London, Midland and Scottish Rly.	307·1	40·1	14·5
	Devonia	520	1905	,,	P. and A. Campbell, Ltd.	245·0	29·0	9·7
	Empress of Asia	16,909	1913	,,	Canadian Pacific Steamships, Ltd.	570·1	68·2	42·0

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* Registered dimensions; see note on p. 596.

† The speeds used in compiling this table are as given by the owners.

FASTEST STEAMERS OF THE WORLD†—*continued.*

Speed (knots.)	Name.	Gross Tonnage	Date built.	Flag.	Owners.	L.* (ft.).	B.* (ft.)	D.* (ft.).
20 and under 21	Empress of Canada .	21,517	1922	British	Canadian Pacific Steamships, Ltd.	627·0	77·9	42·2
	Empress of Russia .	16,810	1913	,,	,,	570·2	68·2	42·0
	Lady Moyra . . .	519	1905	,,	P. and A Campbell, Ltd.	245·0	29·0	9·7
	Loongana	2,448	1904	,,	Tasmanian Steamers Pty., Ltd.	300·3	43·1	23·3
	Maori	3,488	1907	,,	,,	350·5	47·2	24·7
	Malines	2,969	1921	,,	London & North Eastern Rly.	320·7	43 2	25·7
	Nairana	3,042	1917	,,	Tasmanian Steamers Pty., Ltd.	315·8	45·6	23·6
	Queen Alexandra. .	785	1912	,,	J. Williamson & Co.	270·3	32·1	11·0
	St. George. . . .	2,571	1906	,,	London & North Eastern Rly.	352·0	41·1	16·2
	Westward Ho. . .	438	1894	,,	P. and A. Campbell, Ltd.	225·0	26·1	9·5
	Jan Breydel . . .	1,767	1909	Belgian	Belgian Government	348·0	40·0	23·2
	Pieter de Conninck .	1,767	1910	,,	,,	348·0	40·0	23·2
	Princesse Elisabeth .	1,747	1905	,,	,,	357·0	40·0	23·2
	Stad Antwerpen . .	1,384	1913	,,	,,	300·0	36·0	22·9
	Ville de Liege . .	1,384	1913	,,	,,	300·0	36·0	22·9
	Charles Roux . . .	4,104	1908	French	Cie. Gén. Transatlantique	385·5	45·6	26·1
	Lutetia	14,654	1913	,,	Cie. de Nav. Sud Atlantique	579·0	64·1	36·7
	Massilia	15,147	1916	,,	,,	574·0	64·0	40·2
	Giulio Cesare . . .	21,657	1921	Italian	Nav. Gen. Italiana	602·4	76·5	46·3
	Città di Catania . .	3,397	1910	,,	Italian State Rlys.	363·5	42·1	18·8
	Città di Siracusa . .	3,497	1910	,,	,,	363·5	42·1	18·5
	Nagasaki Maru . .	5,272	1922	Japanese	Nippon Yusen Kabushiki Kaisha	395·0	54·2	29·0
	Shanghai Maru . .	5,252	1923	,,	,,	395·0	54·2	29 0
	Agamemnon . . .	19,361	1902	U.S.	U.S. Shipping Board	684·3	72·3	40·2
	City of Detroit III. .	6,061	1912	,,	Detroit and Cleveland Navigation Co.	455·8	55·5	22·5
	Mount Vernon . .	18,372	1906	,,	U.S. Shipping Board	685·4	72·2	40·5
	Midland	1,535	1895	,,	Norfolk and Washington Steamboat Co.	260·0	46·0	14·1
	Northland . . .	2,055	1911	,,	,,	291·2	51·0	18·0
	Southland. . . .	2,081	1908	,,	,,	291·2	51·0	16·1
	Tacoma	836	1913	,,	J. Green	209·4	30·0	17·6

* Registered dimensions; see note on p. 596.

NUMBERS OF MERCHANT VESSELS OF VARIOUS SPEEDS.†

Speed.	Number.				Speed.	Number.			
	1910.	1921.	1922.	1923.		1910.	1921.	1922.	1923.
25 knots and over . .	—	1	8	4	16½ knots . .	45	45	44	49
24 ,, and under 25	—	10	9	8	16 ,, . .	126	124	131	134
23 ,, ,, 24	—	6	5	8	15½ ,, . .	47	35	35	44
22 ,, ,, 23	—	17	17	19	15 ,, . .	215	183	185	197
21 ,, ,, 22	—	21	20	7	14½ ,, . .	85	76	81	85
20 ,, ,, 21	105*	30	32	36	14 ,, . .	276	276	289	306
19 ,, ,, 20	42	26	26	23	13½ ,, . .	138	163	170	162
18½ knots	24	20	18	20	13 ,, . .	462	434	458	466
18 ,, ...	60	52	54	53	12½ ,, . .	206	148	153	172
17½ ,, ...	48	42	36	35	12 ,, . .	732	739	790	848
17 ,, ...	83	80	88	124					

* This figure includes all merchant steamers of 20 knots and over in existence in 1910.
† The speeds used in compiling these tables are as given by the owners.

PARTICULARS OF FASTEST VOYAGES ON PRINCIPAL PASSENGER SERVICES.

Name of vessel.	Owners.	Date of Voyage.	Ports between which Voyage was made.	Total distance (Sea miles).	Time taken.	Average speed (Knots).	Best day's run (Knots).	Remarks.
Mauretania . .	Cunard Steam Ship Co., Ltd.	Sept., 1910	Liverpool and New York	2,780*	4 days, 10 hours, 41 mins.	26·06	—	* The distance given is between Daunts Rock and Sandy Hook Lightship, the points between which the time was taken. On a voyage in January, 1911, the Mauretania attained a speed of 27·04 knots for one day, and the best day's run on the same voyage was 676 knots. Her record average speed for the whole voyage is 26·06 knots. For a short period the vessel has actually attained a speed of 28·5 knots.
Majestic . . .	White Star Line	Nov., 1922	New York and Southampton *via* Cherbourg	3,104 (ocean passage)	5 days, 6 hours, 13 mins.	24·59	572	
Empress of France	Canadian Pacific Steamships, Ltd.	Aug. 25–31, 1920	Liverpool and Quebec	2,633	5 days, 20 hours, 6 mins.	18·8	484	
China	Peninsular and Oriental Steam Navigation Co.	Sept. 26 to Oct. 14, 1919	London and Bombay	6,258	17 days 20 hours.†	15·7	—	
Orcoma . . .	Pacific Steam Navigation Co.	Feb. 22 to May 7, 1923	Liverpool, Valparaiso, Liverpool, *via* Panama Canal	18,627	73 days 8 hours (actual steaming 55 d. 8½ h.)	14·0	371	
Paris	Southern Railway and French State Railway	July 14, 1913	Newhaven and Dieppe	65	2 hours, 35 mins., 37 secs.	25·07	—	
Maid of Orleans .	Southern Railway	April 25 & 28, 1922	Dover and Calais	20	50 mins.	24·0	—	† Record sea transit to Bombay, but not record speed as vessel did not have to deviate to Marseilles.
St. George . .	Gt. Western Railway ‡	July 6, 1910	Fishguard and Rosslare	54	2 hours, 28 mins.	21·9	—	
Lorina	Southern Railway	Sept. 4, 1920	Jersey and Southampton	130	6 hours, 34 mins.	19·8	—	‡ Now owned by the London and North Eastern Railway.

NUMBERS OF VESSELS CLASSED BY VARIOUS CLASSIFICATION SOCIETIES.*

Society.		1910.	1913.	1919.	1920.	1921.	1922.	1923.
Lloyd's Register		10,302	10,466	9175	9924	10,154	10,361	10,296
British Corporation		675	876	1002	1021	1190	1341	1306
American Bureau of Shipping	Record of American and Foreign Shipping	1139	846	926	1581	2216	2565	2392
	Gt. Lakes Register	609	572	442	393	392	382	416
Bureau Veritas		4626	5165	5706	5666	6387	6521	4998
Norske Veritas		1560	1604	955	1034	1109	1217	1242
Registro Italiano		1263	1442	699	975	1280	1987	1872
Germanischer Lloyd		2672	2848	—	—	2219	—	2799
Veritas Adriatico		1041	1146	516	376	471	†	†

* Many vessels, of course, are not exclusively classed in one Register.

† The Veritas Adriatico is now amalgamated with the Registro Italiano.

PAY IN THE MERCHANT SERVICE.—MONTHLY RATES.

*Foreign-going Cargo Steamers.**

Rating.	1914.	1923.†
	£ s. £ s.	£ s. £ s.
First Mates	12 5 to 14 5	16 0 to 25 0
Second Mates	9 5 „ 12 15	13 10 „ 17 0
Third Mates	7 10 „ 10 10	11 10 „ 12 10
Chief Engineers	16 15 „ 24 0	20 0 „ 33 0
Second Engineers	12 5 „ 14 15	16 0 „ 25 0
Third Engineers	8 15 „ 11 15	13 10 „ 17 0
Carpenters	7 0 „ 7 10	11 10 „ 13 10
Boatswains	6 5 „ 6 10	10 10 (Fixed rate.)
Firemen	5 10 „ 6 0	9 10 „
Able Seamen	5 0 „ 5 10	9 0 „

* On Oil-Tank Vessels, the 1923 rates are supplemented by the following percentage additions:—

Chief Engineers	12½ per cent.
First Mates and Second Engineers	10 „
Other Mates and Engineers	7½ „

On Motor Vessels there is a special National Standard Scale of Pay for Engineer Officers substantially higher than on steam-driven vessels.

† The 1923 figures are the National Maritime Board standard rates of pay, based, in the case of Navigating and Engineer Officers, on tonnage and seniority.

On Passenger Liners, Navigating and Engineer Officers, as a rule, receive now, as before the War, wages from 10 to 25 per cent. higher than the Standard Cargo-Vessel rates.

NUMBER AND GROSS TONNAGE OF THE VESSELS OF 100 TONS GROSS AND UPWARDS (STEAM, SAIL, AND MOTOR) BELONGING TO EACH OF THE SEVERAL COUNTRIES OF THE WORLD, AS RECORDED IN LLOYD'S REGISTER.

Flag.		June, 1913.		June, 1919.		June, 1920.	
		No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.
Gt. Britain and Ireland		9,214	18,696,237	7,964	16,555,471	8,561	18,330,424
British Dominions		2,073	1,735,306	2,141	2,052,404	2,270	2,252,228
Total		11,287	20,431,543	10,105	18,607,875	10,831	20,582,652
American	Sea	2,696	2,998,457	4,350	10,782,170	4,889	13,789,874
	Lakes	627	2,382,690	506	2,257,786	492	2,207,429
	Philippine Islands	77	46,489	73	51,817	76	51,986
	Total	3,400	5,427,636	4,929	13,091,773	5,475	16,049,289
Argentine		308	214,835	215	154,441	198	150,023
Austro-Hungarian		427	1,011,414	339	714,617	—	—
Belgian		172	304,386	152	313,276	213	415,112
Brazilian		459	329,637	428	512,675	400	497,086
Chilian		131	139,792	114	101,647	112	103,788
Chinese		66	86.690	102	132,515	102	142,834
Cuban		59	61,536	51	47,295	53	53,439
Danish		811	762,054	645	702,436	745	803,411
Dutch		759	1,309,849	931	1,591,911	987	1,793,396
Esthonian		—	—	—	—	—	—
Finnish		—	—	338	180,962	312	166,689
French		1,552	2,201,164	1,440	2,233,631	1,758	3,245.194
German		2,321	5,082,061	1,768	3,503,380	1,138	672,671
Greek		442	722,782	312	323,796	405	530,261
Italian		1,114	1,521,942	858	1,370,097	1,115	2,242,393
Japanese		1,037	1,500,014	1,418	2,325,266	1,940	2,995,878
Latvian		—	—	—	—	—	—
Norwegian		2,191	2,457,890	1,629	1,857,829	1,777	2,219.388
Peruvian		60	45,514	63	79,342	69	88,962
Portuguese		208	120.579	227	261,212	249	275,665
Roumanian		33	45,408	35	63,792	39	74,540
Russian		1,216	974,178	618	541,005	613	534,547
Spanish		607	840,995	576	750,611	749	997,030
Swedish		1,436	1,047,270	1,263	992,611	1,297	1,072,925
Turkish		272	157,298	161	116,249	—	—
Uruguayan		65	75,531	43	44,499	47	63,837
Other Countries and flag not recorded		158	98,115	495	304,530	989	1,542,272
Total		30,591	46,970,113	29,255	50,919,273	31,595	57,314,065

NUMBER AND GROSS TONNAGE OF THE VESSELS OF 100 TONS GROSS AND UPWARDS (STEAM, SAIL, AND MOTOR) BELONGING TO EACH OF THE SEVERAL COUNTRIES OF THE WORLD, AS RECORDED IN LLOYD'S REGISTER—*continued.*

Flag.		June, 1921.		June, 1922.		June, 1923.	
		No.	Gross Tonnage.	No.	Gross Tonnage.	No.	Gross Tonnage.
Gt. Britain and Ireland		9,034	19,571,554	8,849	19,295,637	8,694	19,281,549
British Dominions .		2,399	2,499,244	2,472	2,746,883	2,441	2,776,563
Total		11,433	22,070,798	11,321	22,042,520	11,135	22,058,112
American	Sea . .	4,958	14,697,088	4,886	14,738,506	4,812	14,597,035
	Lakes . .	494	2,254,930	495	2,247,690	513	2,286,619
	Philippine Islands .	99	73,984	99	76,264	91	61,709
	Total .	5,551	17,026,002	5,480	17,062,460	5,416	16,945,363
Argentine		209	167,154	216	181,555	199	178,465
Austro-Hungarian . .		—	—	—	—	—	—
Belgian		256	551,031	275	579,477	270	616,670
Brazilian		402	499,325	399	492,571	382	478,630
Chilian		124	113,447	126	131,401	137	171,958
Chinese		122	163,037	134	188,388	157	222,970
Cuban		59	58,553	65	62,677	64	50,425
Danish		798	964,464	822	1,038,138	780	996,862
Dutch		1,069	2,225,787	1,164	2,632,718	1,114	2,625,741
Esthonian		90	41,183	98	45,259	112	49,403
Finnish		330	198,352	352	213,671	319	200,254
French		2,044	3,652,249	2,094	3,845,792	2,021	3,737,244
German		1,255	717,450	1,723	1,887,408	1,843	2,590,073
Greek		362	599,929	379	668,127	405	755,441
Italian		1,271	2,650,573	1,413	2,866,335	1,415	3,033,742
Japanese		2,033	3,354,806	2,026	3,586,918	2,003	3,604,147
Latvian		99	53,342	67	40,124	55	39,006
Norwegian		1,889	2,584,058	1,852	2,600,861	1,800	2,551,912
Peruvian		68	87,167	74	101,209	47	82,193
Portuguese		284	296,847	286	285,878	284	301,607
Roumanian		37	73,973	31	72,297	32	73,848
Russian		465	412,459	—	—	—	—
Spanish		828	1,165,541	973	1,282,757	949	1,260,206
Swedish		1,353	1,160,211	1,345	1,115,375	1,385	1,207,727
Turkish		—	—	—	—	—	—
Uruguayan		54	85,886	53	76,311	67	85,511
Other Countries and flag not recorded .		721	1,001,029	1,167	1,270,564	1,116	1,248,728
Total		33,206	61,974,653	33,935	64,370,786	33,507	65,166,238

WORLD'S TOTAL MERCHANT TONNAGE, BRITISH AND IRISH TONNAGE, AND PERCENTAGE OF BRITISH AND IRISH TONNAGE OF THE WORLD'S TOTAL.

Year.	World.		Great Britain and Ireland.		Percentage of British and Irish Tonnage to Total.
	Number.	Tonnage.	Number.	Tonnage.	
1890	32,174	21,118,528	9,167	10,241,856	48·4
1891	32,227	22,912,753	9,098	10,585,747	46·3
1892	31,983	23,672,698	9,260	11,157,662	47·1
1893	31,926	24,236,865	9,333	11,563,997	47·6
1894	30,640	24,547,597	9,261	11,807,010	48·1
1895	30,288	25,086,199	9,227	12,117,957	48·3
1896	29,801	25,593,186	9,140	12,293,539	48·1
1897	28,280	25,889,044	9,107	12,403,409	47·9
1898	27,982	26,543,360	9,044	12,587,904	47·4
1899	27,816	27,613,851	8,973	12,926,924	46·8
1900	27,840	28,957,358	8,914	13,241,446	45·8
1901	28,209	30,479,971	8,934	13,656,161	44·8
1902	28,630	32,302,412	9,043	14,431,072	44·7
1903	28,901	33,501,855	9,152	14,889,571	44·5
1904	29,283	34,786,132	9,236	15,391,350	44·3
1905	29,750	35,998,180	9,348	15,803,180	43·9
1906	30,087	37,550,477	9,408	16,381,850	43·6
1907	30,197	39,435,788	9,517	16,999,668	43·1
1908	30,524	40,920,551	9,542	17,318,351	42·3
1909	36,536	41,447,825	9,491	17,377,936	42·0
1910	30,053	41,912,520	9,417	17,516,479	41·9
1911	30,082	43,144,909	9,334	17,872,697	41·4
1912	30,316	44,600,677	9,279	18,213,620	40·8
1913	30,591	46,970,113	9,214	18,696,237	39·8
1914	30,836	49,089,552	9,240	19,256,766	39·4
1915	30,720	49,261,769	9,285	19,541,368	39·7
1916	30,167	48,683,136	9,069	19,134,857	39·3
1917*	—	—	—	—	—
1918*	—	—	—	—	—
1919	29,255	50,919,273	7,964	16,555,471	32·5
1920	31,595	57,314,065	8,561	18,330,424	32·0
1921	33,206	61,974,653	9,034	19,571,554	31·6
1922	33,935	64,370,786	8,849	19,295,637	30·0
1923	33,507	65,166,238	8,694	19,281,549	29·6

* Figures for 1917 and 1918 not available.

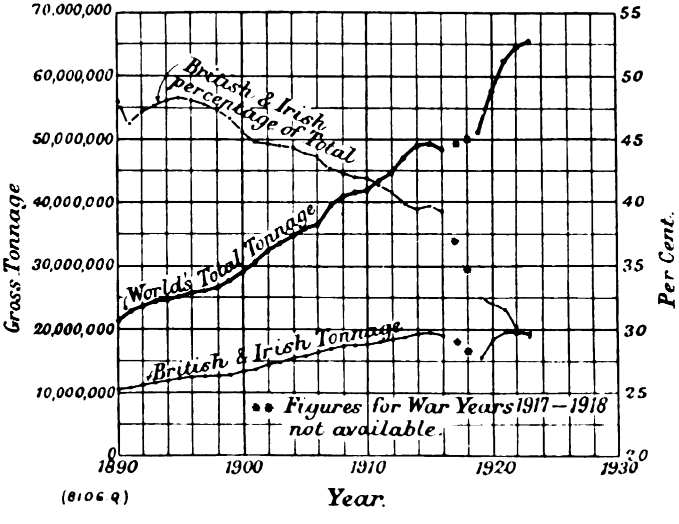


TABLE SHOWING THE NUMBERS AND GROSS TONNAGES OF STEAMERS AND MOTOR VESSELS OWNED BY THE PRINCIPAL MARITIME COUNTRIES ON JUNE 30, 1923.

Country.	Numbers of Vessels Owned of Various Gross Tonnages.										Total Number of Vessels owned.	Percentage of Total Number of Ships of 6000 gross tons and over.
	100 tons and under 500 tons.	500 tons and under 1000 tons.	1000 tons and under 2000 tons.	2000 tons and under 4000 tons.	4000 tons and under 6000 tons.	6000 tons and under 8000 tons.	8000 tons and under 10,000 tons	10,000 tons and under 15,000 tons.	15,000 tons and under 20,000 tons.	20,000 tons and over.		
Gt. Brit. & Ireland	3,733	752	835	955	1,141	512	186	131	35	19	8,299	10·6
British Dominions	905	245	276	266	119	35	8	8	3	—	1,865	2·9
United States . .	710	221	262	1,334	942	669	102	61	3	3	4,307	19·5
Denmark . . .	181	91	202	93	32	9	2	4	—	—	614	2·4
France	681	129	222	321	176	66	40	21	1	2	1,659	7·8
Germany . . .	812	345	235	164	105	52	20	7	1	4	1,745	4·8
Holland . . .	379	72	174	171	107	103	33	8	3	1	1,051	14·1
Italy	284	87	119	248	199	81	15	5	2	3	1,043	10·2
Japan . . .	811	300	263	311	206	83	18	11	—	—	2,003	6·1
Norway . .	672	210	409	226	111	39	—	2	—	—	1,669	2·5
Spain	322	96	110	193	45	8	1	4	—	—	779	1·7
Sweden . . .	627	147	249	85	49	4	—	3	—	—	1,164	0·6
Other Countries .	1,386	451	479	454	219	38	16	2	2	1	3,048	1·9
Total for the whole World . . .	11,503	3,146	3,835	4,821	3,451	1,699	441	267	50	33	29,246	8·6

TABLE SHOWING THE NUMBERS AND AGES OF STEAMERS AND MOTOR VESSELS OWNED BY THE PRINCIPAL MARITIME COUNTRIES ON JUNE 30, 1923.

Country.	Numbers of Vessels owned of Various Ages.						Total Number of Vessels owned.	Percentage of Total Number of Ships under 5 years old.
	Under 5 years.	5 years and under 10 years.	10 years and under 15 years.	15 years and under 20 years.	20 years and under 25 years.	25 years and over.		
Gt. Brit. & Ireland	1,637	1,669	1,278	1,195	927	1,593	8,299	19·8
British Dominions	294	227	335	284	231	494	1,865	15·8
United States . .	1,757	.917	848	377	355	463	4,217	41·7
Denmark . . .	184	99	46	93	61	131	614	30
France	447	261	236	234	133	348	1,659	27
Germany . . .	626	212	198	229	150	330	1,745	35·9
Holland . . .	296	288	133	108	137	89	1,051	28·2
Italy	192	153	123	119	137	319	1,043	18·4
Japan	466	688	160	176	141	372	2,003	23·2
Norway . . .	369	352	226	226	153	343	1,669	22·1
Spain	156	101	42	42	65	373	779	20
Sweden . . .	160	179	93	117	117	498	1,164	13·7
Other Countries .	329	315	426	498	372	1,198	3,138	10·5
Total for the whole World . . .	6,913	5,461	3,644	3,698	2,979	6,551	29,246	23·6

FLUCTUATIONS IN THE PRICE OF A NEW, READY, 7,500-TON CARGO STEAMER.

Period.	£.
1898 (Sept.)	48,500
1905 (June)	36,500
1908 (June)	**36,000**
1910 (Jan.)	39,000
1912 (Dec.)	58,000
1914 (June)	42,500
1914 (Dec.)	55,000
1915 (Jan.)	60,000
1915 (June)	82,500
1915 (Sept.)	93,500
1916 (Jan.)	125,000
1916 (June	180,000
1917 (Jan.)	187,500
1918 (Jan.)	165,000
1918 (June)	180,500
1919 (Jan.)	169,000
1920 (Jan.)	**232,000**
1920 (June)	180,000
1921 (Jan.)	105,000
1921 (June)	63,750
1922 (Jan.)	60,000
1922 (June)	62,000
1923 (Jan.)	65,625
1923 (June)	62,500

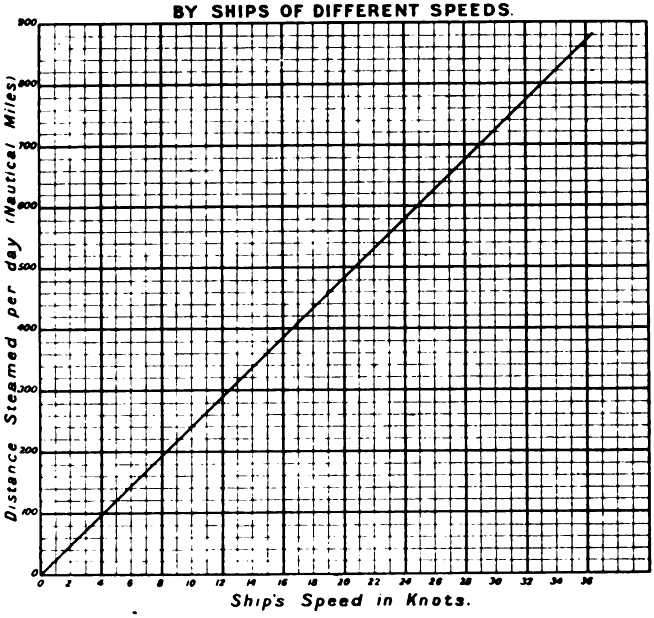
Compiled from "Fairplay," July 5, 1923.

NOTE.—The highest and lowest prices are given in heavy type.

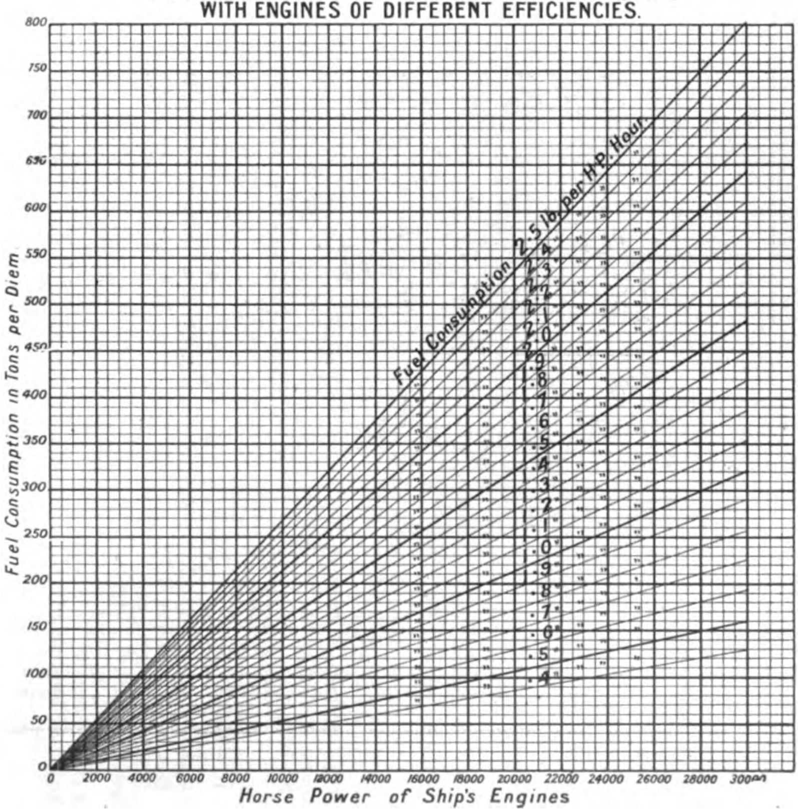
IMPORTANT DATES IN THE DEVELOPMENT OF MARINE PROPELLING MACHINERY.

—	Approximate Date of Introduction in the United Kingdom.			
	Merchant.		Naval.	
Compound engines	—	1860	—	1865
Triple-expansion engines	—	1880	—	1885
Quadruple-expansion engines	—	1890	Not fitted	—
Cylindrical boilers	—	1862	—	1869
Water-tube boilers	Cross-channel	1911	Destroyers	1893
	Ocean liners	1914	Battleships	1897
Direct turbines	Cross-channel	1901	Destroyers	1898
	Ocean liners	1905	Light cruisers	1904
			Battleships	1906
Combination engines and turbines	Intermediate liner	1908	(For cruising only)	1902
Geared turbines	Single-reduction	1911	Single-reduction	1913
	Double-reduction	1916	Not fitted	—
Electric propulsion	First attempts	1904	Not fitted	—
	Modern plant	1912	—	—
Oil fuel burning	First attempts	1870	Coal and oil—	
			Destroyers	1902
			Battleships	1904
	Modern plant	1892	Oil alone—	
			Destroyers	1910
			Battleships	1913
Heavy oil engines	First attempts	1904	Tender	1914
	Modern plant	1910	Submarines	1908

DIAGRAM SHOWING DISTANCE STEAMED IN ONE DAY BY SHIPS OF DIFFERENT SPEEDS.



DAILY FUEL CONSUMPTION OF STEAMERS & MOTOR SHIPS WITH ENGINES OF DIFFERENT EFFICIENCIES.



PROGRESS IN MARINE MACHINERY—ATLANTIC LINERS

	1881.	1888.	1893.	1899.	1907.	1914	1921.
Ship Dimensions—							
Length	500′ 0″	528′ 0″	600′ 0″	685′ 0″	760′ 0″	865′ 0″	912′ 0″
Beam	50′ 0″	63′ 0″	65′ 0″	68′ 5″	87′ 6″	96′ 6″	100′ 0″
Performance—							
Speed in Knots	18·0	20·1	22·0	20·7	26·0	23·5	23·5
Horse Power	10,680	18,500	30,000	27,000	72,500	60,000	66,000
Engines—							
No. of Propellers . . .	One	Two	Two	Two	Four	Four	Four
Type of Machinery . . .	Vertical Compound	Vertical Triple Expansion	Vertical Triple Expansion	Vertical Triple Expansion	Steam Turbines	Steam Turbines	Steam Turbines.
Cylinders on each shaft .	68″, 100″, 100″ by 72″ stroke	45″, 71″, 113″ by 60″ stroke	37″, 37″, 79″, 98″, 98″ by 69″ stroke	47½″, 79″, 93″, 93″ by 72″ stroke	— —	— —	— —
Revolutions of Propeller .	64·2	86	81	78	180	180	180
Piston Speed (f.p.m.) . .	770	860	930	936	—	—	—
Referred M.P. (lb. per sq. in.)	29·1	35·3	35	35	—	—	—
Boilers—							
No. and type	— Cylindrical	9 double-ended Cylindrical	12 double-ended Cylindrical	15 double-ended Cylindrical	23 double-ended & 2 single-ended Cylindrical	21 double-ended Cylindrical	48 Water-tube (oil-fired)
Working-pressure (lb. per sq. in.)	100	150	165	192	195	195	260
System of Draught . .	Natural Draught	Closed Stokehold	Natural Draught	Assisted Draught	Howden's	Howden's	Forced
Heating Surface per H.P. .	3·3 sq. ft.	2·75 sq. ft.	2·73 sq. ft.	2·77 sq. ft.	2·19 sq. ft.	2·31 sq. ft.	3·33 sq. ft.
H.P. per sq. ft. of grate .	8·57	14·3	11·4	13·75	17·9	16·9	16·4
Total Weight of Machinery "Steam up"	1860 tons	2516 tons	4935 tons	4414 tons	9936 tons	9302 tons	—
H.P. per ton of Machinery	5·74	7·4	6·1	6·1	7·3	6·5	—
Coal Consumption per H.P. hour	—	1·7 lbs.	1·6 lbs.	—	1·4 lbs	1·3 lbs.	—

PROGRESS IN MARINE MACHINERY—INTERMEDIATE OCEAN LINERS.*

Year	1880.	1892.	1911.	1914.	1920.
Ship dimensions—					
Length	400 ft.	470 ft.	520 ft.	550 ft.	550 ft.
Beam	45 ft.	53 ft.	64 ft.	66 ft. 6 in.	66 ft.
Performance—					
Speed in knots	12·5	12·5	14·5	16·5	17
Horse-power	3,000 I.H.P.	3,500 I.H.P.	7,500 I.H.P.	11,000 S.H.P.	11,000 S.H.P.
Engines—					
No. of propellers	One	Two	Two	Two	Two
Type of machinery . . .	Vertical compound	Vertical triple-expansion	Vertical quadruple expansion	Geared steam turbines	Geared steam turbines
Dimensions of cylinders . .	52-in., 96-in. by 66-in.	22½-in., 36½-in., 60-in. by 48-in.	26-in., 37-in., 53-in., 76-in. by 54-in.	Two H.P. and two L.P. turbines with single-reduction-gearing	Two H.P. and two L.P. turbines with double-reduction-gearing
Propeller (revs. per min.) .	61	80	82	133	85
Piston speed (feet per min.)	671	640	738	Turbine revs. 1,650	H.P. turbine, revs. 3,200 ; L.P. turbine, revs. 2,000
Referred mean pressure . .	20·5	32·0	37	—	—
Condenser surface per H.P. .	1·85	1·6	0·84	0·80	0·62
Boilers—					
No. and type	Two cylindrical	Two D.E. and one S.E. cylindrical	Five double-ended cylindrical	Five double-ended cylindrical	Five water-tube boilers, burning oil fuel (with superheaters)
Working pressure (lb. per sq. in.)	90	170	210	210	250
System of draught . . .	Natural	Natural	Natural	Howden's forced draught	Oil-burning with forced draught
Heating surface per H.P. .	3·1 sq. ft.	3·3 sq. ft.	3·25 sq. ft.	2·5 sq. ft.	2·25 sq. ft.
H.P. per sq. feet of grate .	7·6	10·0	11·75	17·5	—
Total weight of machinery "Steam up"	685 tons	795 tons	1,750 tons	1,800 tons	1,210 tons
H.P. per ton of machinery . .	4·35	4·4	4·25	6·1	9·1
Coal consumption per H.P. hour	2·375 lb.	1·875 lb.	1·55 lb.	1·4 lb.	0·875 lb. (Oil).

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* This and the two succeeding tables are from "Two Centuries of Shipbuilding by the Scotts at Greenock" (1920).

PROGRESS IN MARINE MACHINERY—CARGO STEAMERS.

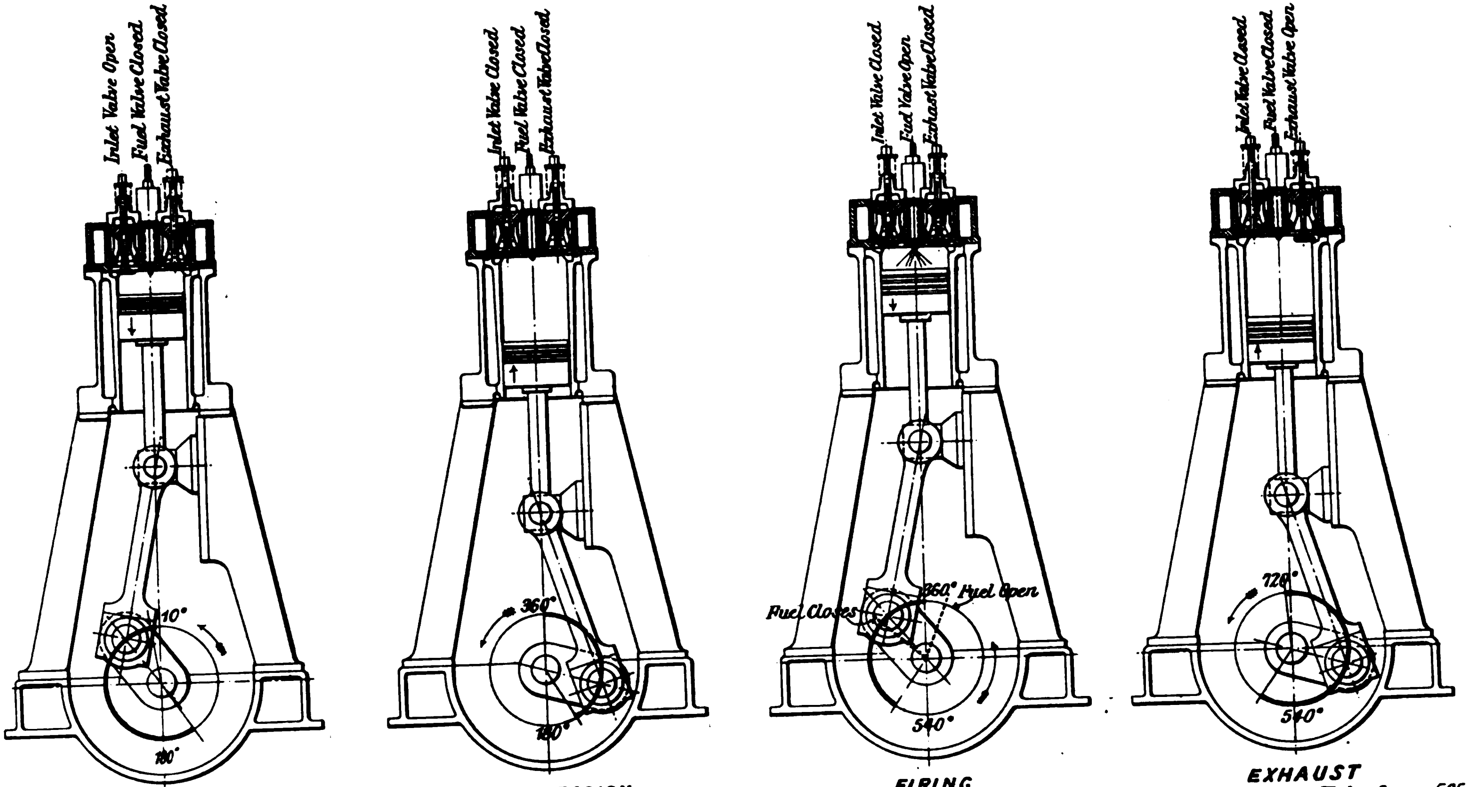
Year	1877.	1885.	1911.	1914.	1920.
Ship dimensions—					
Length	314 ft.	320 ft.	440 ft.	450 ft.	503 ft.
Beam	35 ft.	38 ft.	52 ft. 6 in.	56 ft.	63 ft.
Performance—					
Speed in knots	11·25	12·25	13·25	14·25	14·25
Horse-power	775 I.H.P.	1,650 I.H.P.	4,200 I.H.P.	4,000–5,000 S.H.P.	7,000 S.H.P.
Engines—					
No. of propellers	One	One	One	One	Two
Type of machinery	Tandem compound with flywheel	Triple-expansion	Triple-expansion	Steam turbines and single-reduction gearing; one H.P. and one L.P. turbine	Steam turbines and double-reduction gearing; two H.P. and two L.P. turbines
Propeller (revs. per min.)	52	70	73	102	80
Piston speed (feet per min.)	450	560	750	1,350 revs. of turbines	H.P. turbines, 3,500 revs.; L.P. turbines, 2,500 revs.
Referred mean pressure	23	31·5	35	—	—
Condenser surface per H.P.	2·17	1·83	1·5	1·18	1·12
Boilers—					
No. and type	One-Oval ends and round middle portion	Two cylindrical	Two main cylindrical	Two cylindrical	Three cylindrical oil-fired boilers with superheaters
Working pressure (lb. per sq. in.)	70	150	190	195	200
System of draught	Natural	Natural	Forced draught	Howden's forced draught	Oil burning with forced draught
Heating surface per H.P. (sq. ft.)	4·46	2·82	2·8	2·30	2·25
H.P. per sq. ft. of grate	7·6	10·4	16·25	20·0	—
Weights—					
Weight of machinery	200	340	900	930	1,100
H.P. per ton of machinery	3·87	4·85	4·67	6·45	6·35
Coal consumption per H.P. hour	About 2·5 lb.	1·95 lb.	1·65 lb.	1·45 lb.	0·85 lb. (Oil)

PROGRESS IN MARINE MACHINERY—CROSS-CHANNEL STEAMERS.

Year	1890.	1898.	1904.	1910.	1920.
Ship dimensions—					
Length	300 ft.	315 ft.	330 ft.	316 ft.	302 ft.
Beam	34 ft. 6 in.	37 ft.	42 ft.	41 ft.	35 ft. 6 in.
Performance—					
Speed in knots	18	19·75	19·5	21·5	23·5
Horse-power	4,400 I.H.P.	5,520 I.H.P.	5,500 S.H.P.	8,500 S.H.P.	12,300 S.H.P.
Engines—					
No. of propellers	Two	Two	Three	Three	Two
Type of machinery	Three-cylinder triple-expansion	Four-cylinder triple-expansion	Direct steam turbines, one H.P. and two L.P.	Direct steam turbines, one H.P. and two L.P.	Geared steam turbines, two H.P. and two L.P.
Propeller (revs. per min.)	130	165	550	625	435
Piston speed (feet per min.)	780	910	Turbines, 550 revs.	Turbines, 625 revs.	H.P. turbine, 2,600 revs.; L.P. turbine, 1,800 revs.
Referred mean pressure	30·75	43·0	—	—	—
Condenser surface per H.P.	1·42	1·4	1·35	0·75	0·6
Boilers—					
No. and type	Five S.E. cylindrical	Four S.E. cylindrical	Two D.E. and one S.E. cylindrical	Seven water-tube	Eight water-tube
Working pressure (lb. per sq. in.)	160	180	150	190	195
System of draught	Natural	Forced	Forced	Forced	Forced
Heating surface per H.P. (sq. ft.)	2·6	1·95	1·9	1·95	2
H.P. per sq. ft. of grate	12·25	17·5	16·5	15 0	22·0
Total weight of machinery—					
Steam up	590 tons	610 tons	590 tons	735 tons	1,055 tons
H.P. per ton of machinery	7·45	9·62	9·3	11·6	11·65
Coal consumption per H.P. hour	2·25 lb.	2·1 lb.	1·8 lb.	1·7 lb.	1·50 lb.

PROGRESS IN MARINE MACHINERY—MOTOR SHIPS.

	1909.	1910.	1912.	1914.	1916.	1922.
Ship Dimensions—						
Length	210 ft.	260 ft.	380 ft.	425 ft.	450 ft.	502 ft.
Beam	38 ft.	43 ft.	53 ft.	55 ft.	57 ft.	62 ft.
Performance—						
Speed	$8\frac{1}{2}$ knots	$10\frac{1}{2}$ knots	11 knots	$11\frac{1}{4}$ knots	12 knots	$13\frac{1}{2}$ knots
Indicated horse-power	490	1,460	2,500	3,100	4,000	6,400
Engines—						
No. of propellers	1	1	2	2	2	2
Type of engine	4-cycle single acting	4-cycle single acting	4-cycle single acting	4-cycle single acting	4-cycle single acting	4-cycle single acting
Cylinders per shaft	6	6	8	6	6	8
Bore	$15\frac{3}{4}$ in.	22 in.	$20\frac{7}{8}$ in.	$24\frac{7}{8}$ in.	$29\frac{1}{8}$ in.	$29\frac{1}{8}$ in.
Stroke	$28\frac{5}{8}$ in.	$39\frac{3}{8}$ in.	$28\frac{3}{4}$ in.	$37\frac{7}{8}$ in.	$43\frac{5}{16}$ in.	$45\frac{1}{4}$ in.
Revolutions per minute	140	125	140	125	100	115
Piston speed in feet per minute	550	820	670	785	725	865
Mean pressure, lbs. per square inch—						
I.H.P. basis	99	111	89·8	89·5	91	91·5
B.H.P. basis	75	83	68	67	68	69
Type of Auxiliaries	Steam	Steam	Electric	Electric	Electric	Electric
Total weight of machinery	91 tons	220 tons	390 tons	475 tons	600 tons	940 tons
B.H.P. per ton of machinery	4·3	5	4·8	4·9	5	5·1
Oil consumption for all purposes per B.H.P.-hour	0·6 lb.	0·5 lb.	0·47 lb.	0·45 lb.	0·45 lb.	0·45 lb.



MARINE DIESEL ENGINE, FOUR-CYCLE TYPE, DIAGRAM OF OPERATIONS.

INDUCTION
Inlet Valve Opens - 10°
" " Closes - 210°

COMPRESSION

FIRING
Fuel Valve Opens - 340°
" " Closes - 410°

EXHAUST
Exhaust Valve Opens - 505°
" " Closes - 725°

COMPARISONS OF STEAM AND OIL-ENGINED VESSELS.

The table given herewith of comparisons of the cost of operating steam and oil-engined vessels is the same as was given in last year's issue of "Brassey's Annual," page 490.

The savings consequent upon the installation of Diesel machinery compel attention. The relative positions occupied by vessels propelled by the various types of prime movers will be noted.

It is impossible in any such comparisons to take fully into account all the factors which may operate in the case of vessels trading on different routes, but it is hoped that the figures given herewith will indicate the nature of the relative costs.

The following savings, which are effected by the installation of Diesel machinery, have not been taken into account: less fuelling costs, demurrage, no stand-by losses, less cleaning ship, higher average speed in a seaway, reduced fuelling appliances required, etc.

	Diesel Engines.	Reciprocating Steam-Engines.		Turbines.
Type of propelling machinery.	4-cycle single-acting reversible, crosshead. Diesel electric-driven auxiliaries.	Triple-expansion engines, cylindrical boilers, Howden's forced draught, Superheat 50° Fahr.		With reduction gearing, oil fired, Superheat, 150° Fahr.
		Coal-Fired Boilers.	*Oil-Fired Boilers.*	
Total deadweight in tons	10,050	10,230	10,235	10,235
Freight-earning cargo in tons	9,357	7,880	8,555	8,743
Average sea-power, horse-power . . .	2,500 (Shaft)	2,800 (Indicated)	2,800 (Indicated)	2,500 (Shaft)
Radius of action in miles	10,500	10,500	10,500	10,500
Fuel consumption per brake horse-power hour, including auxiliaries, in lb.	0·45	2·0	1·4	1·1
* Fuel consumption per day in tons . . .	12·1	53·5	37·5	29·5
Fuel consumption per voyage of 16 days, in tons	194	856	600	472
Comparative Costs of Working.				
Provisions, total per month	£151	£184 15*s.* 0*d.*	£156 10*s.* 0*d.*	£156 10*s.* 0*d.*
Wages, total per month .	£404	£468	£408	£408
Fuel, per 16 days' sailing	£776 (£4 0*s.* 0*d.* per ton)	£1,070 (£1 5*s.* 0*d.* per ton)	£1,800 (£3 0*s.* 0*d.* per ton)	£1,416 (£3 0*s.* 0*d.* per ton)
Fuel, per month of 24 days' sailing . . .	£1,164	£1,605	£2,700	£2,124
Cost of running for one year of 288 days' sailing	£20,628	£27,096	£39,168	£32,265
Tons of freight-earning cargo carried, assuming 9 round voyages per year, each of 32 days' total sailing out and home	168,426	141,840	153,990	157,274
Cost per ton of cargo carried per 16 days' sailing out and home .	2*s.* 5*d.*	3*s.* 10*d.*	5*s.* 1*d.*	4*s.* 1*d.*
Cost per ton-mile . .	·0076*d.*	·0114*d.*	·0152*d.*	·0121*d.*

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* Calorific value of oil fuel taken at 19,000 B.Th.U.'s. Calorific value of coal taken at 13,500 B.Th.U.'s.

NOTE.—No cognizance has been taken in the above table of the fact that with Diesel ships, bunker fuel oil, costing £3 per ton, can be used.

LIST OF IMPORTANT DIESEL SHIPS IN SERVICE AND BUILDING, GIVING PARTICULARS OF THEIR MACHINERY.

Date.	Name of vessel.	Makers of machinery.	Type of engine.	Cycle.	No. of eng.	Total B.H.P.	I.H.P. per engine.	B.H.P. per engine.	No. of cyl. per eng.	B.H.P. per cyl.	Diameter of cyl. in ins.	Stroke in ins.	Ratio stroke to bore.	Revs. per min.	Piston speed. Ft. per min.	M.E.P. on B.H.P. basis.	M.I.P. on I.H.P. Basis.	Consumption of fuel in lbs. per sq. in. piston area.
1912*	Juno	Werkspoor	Werkspoor	4 single act.	1	1,100	1,460	1,100	6	183	$21\frac{1}{8}$	$39\frac{3}{8}$	1·87	125	820	84·0	111·0	0·219
1919*	Aba (ex Glenapp)	Harland & Wolff	Burmeister and Wain	4 single act.	2	5,250	3,200	2,625	8	328	$29\frac{1}{2}$	$43\frac{5}{16}$	1·46	115	830	76·0	93·0	0·202
1920*	Glenogle	Harland & Wolff	Burmeister and Wain	4 single act.	2	5,250	3,200	2,625	8	328	$29\frac{1}{8}$	$45\frac{1}{4}$	1·55	115	865	75·0	91·5	0·206
1920*	Ansaldo III	Ansaldo San Giorgio	Ansaldo	2 single act.	2	2,400	1,600	1,200	4	300	$24\frac{13}{16}$	$35\frac{7}{16}$	1·43	110	650	63·0	84·0	0·272
1921*	Domala	N.B. Diesel Co.	N.B. Diesel	4 single act.	2	4,000	2,500	2,000	8	250	$26\frac{1}{2}$	47	1·77	96	752	79·5†	99·5	0·191
1921*	Sardinia	Werkspoor	Werkspoor	4 single act.	1	1,600	2,140	1,600	6	267	$26\frac{3}{8}$	$47\frac{1}{4}$	1·79	110	865	74·5	100·0	0·205
1922*	Pizarro	Beardmore & Co.	Beardmore-Tosi	4 single act.	1	1,250	1,670	1,250	6	208	$24\frac{3}{8}$	$38\frac{3}{8}$	1·57	115	735	76·0	100·0	0·185
1922*	Scottish Musician	Vickers, Ltd.	Vickers	4 single act.	2	2,500	1,620	1,250	6	208	$24\frac{1}{2}$	39	1·59	118	767	76·0	99·0	0·185‡
1922*	Dominion Miller	Doxford	Doxford	2 opposed p.	1	2,700	3,000	2,700	4	675	$22\frac{13}{16}$	$91\frac{1}{4}$ comb'd.	2·0	77	585	93·0	103·0	0·362‡
1922*	Loch Katrine	Harland & Wolff	Burmeister and Wain	4 single act.	2	5,250	3,200	2,625	8	328	$29\frac{1}{8}$	$45\frac{1}{4}$	1·55	115	865	75·0	91·5	0·206
1923*	Dalgoma	Stephen & Sons	Sulzer	2 single act.	2	3,200	2,200	1,600	4	400	$26\frac{3}{4}$	$43\frac{5}{16}$	1·62	85	613	76·5	105·0	0·312
1923*	Medon	Götaverken	Burmeister and Wain	4 single act.	1	2,400	3,100	2,400	8	300	$29\frac{1}{8}$	$59\frac{1}{16}$	2·02	85	838	71·0	92·0	0·192§
1923	Arnus	Swan Hunter & Wigham Richardson	Neptune-Polar	2 single act.	2	2,100	1,400	1,050	6	175	17	35	2·06	125	730	70·0	93·0	0·32
1923	Sycamore	Richardsons, Westgarth	Beardmore-Tosi	4 single act.	2	2,500	1,670	1,250	6	208	$24\frac{3}{8}$	$38\frac{3}{8}$	1·57	120	767	74·0	98·0	0·187
1923	Donaldson Liner	Vickers, Ltd.	Vickers	4 single act.	1	2,700	3,500	2,700	8	338	30	45	1·5	110	825	76·0	99·0	0·22‡
1923	Holt Liner	Scott Ship. & Eng. Co.	Still	2 double act.	2	2,500	1,500	1,250	4	312	22	36	1·64	120	720	70 oil 6 steam	84 oil 7·2 st'm	0·28‖
1923	Rotterdam Lloyd	S. & E. Co. De Schelde	Sulzer	2 single act.	2	7,000	4,800	3,500	6	584	$29\frac{7}{8}$	$52\frac{3}{4}$	1·76	85	748	73·5	100·0	0·348
1923	Union S. Co. Liner	Fairfield S. & E. Co.	Sulzer	2 single act.	4	13,000	4,400	3,250	6	542	$27\frac{1}{2}$	39	1·42	135	880	68·5	93·0	0·382¶
1923	—	Cammell Laird & Co.	Camellaird-Fullagar	2 opposed p.	1	3,000	4,000	3,000	6	500	23	72 comb'd.	1·56	86	516	77·0	102·0	0·258
1923	Furness-Withy Vessel	N.B. Diesel Co.	N.B. Diesel	2 double act.	1	2,000	2,750	2,000	3	667	$24\frac{1}{2}$	44	1·8	100	735	64·0	88·0	0·296
1923	Swedish-American Liner	Burmeister & Wain	Burmeister and Wain	4 double act.	2	13,500	8,800	6,750	6	1,125	$31\frac{1}{2}$	$55\frac{1}{8}$	1·75	125	1,250	77·0	99·5	0·3

* In operation at sea. † No compressor on engine. ‡ Solid injection. § Longstroke type. ‖ Solid injection. Oil and steam. ¶ Quadruple screw.

LIST OF THE PRINCIPAL COMMERCIAL FUEL-OIL BUNKERING STATIONS ESTABLISHED THROUGHOUT THE WORLD.

Various publications, British and American, interested in oil or shipping matters furnish particulars from time to time of fuel oil bunkering stations, either by way of more or less comprehensive general lists or of announcements by oil distributing companies. Some of the more comprehensive lists, whilst valuable as showing the widespread provision of fuel oil supplies already made or contemplated, do not in all cases, however, distinguish between installations in actual operation and those under construction, or clearly indicate whether Government installations are the only ones existing at particular ports. In compiling the following list from many sources, our aim has been to specify the principal bunkering ports at which commercial oil installations are in operation. Whilst absolute accuracy cannot be guaranteed, much care has been taken to eliminate errors.

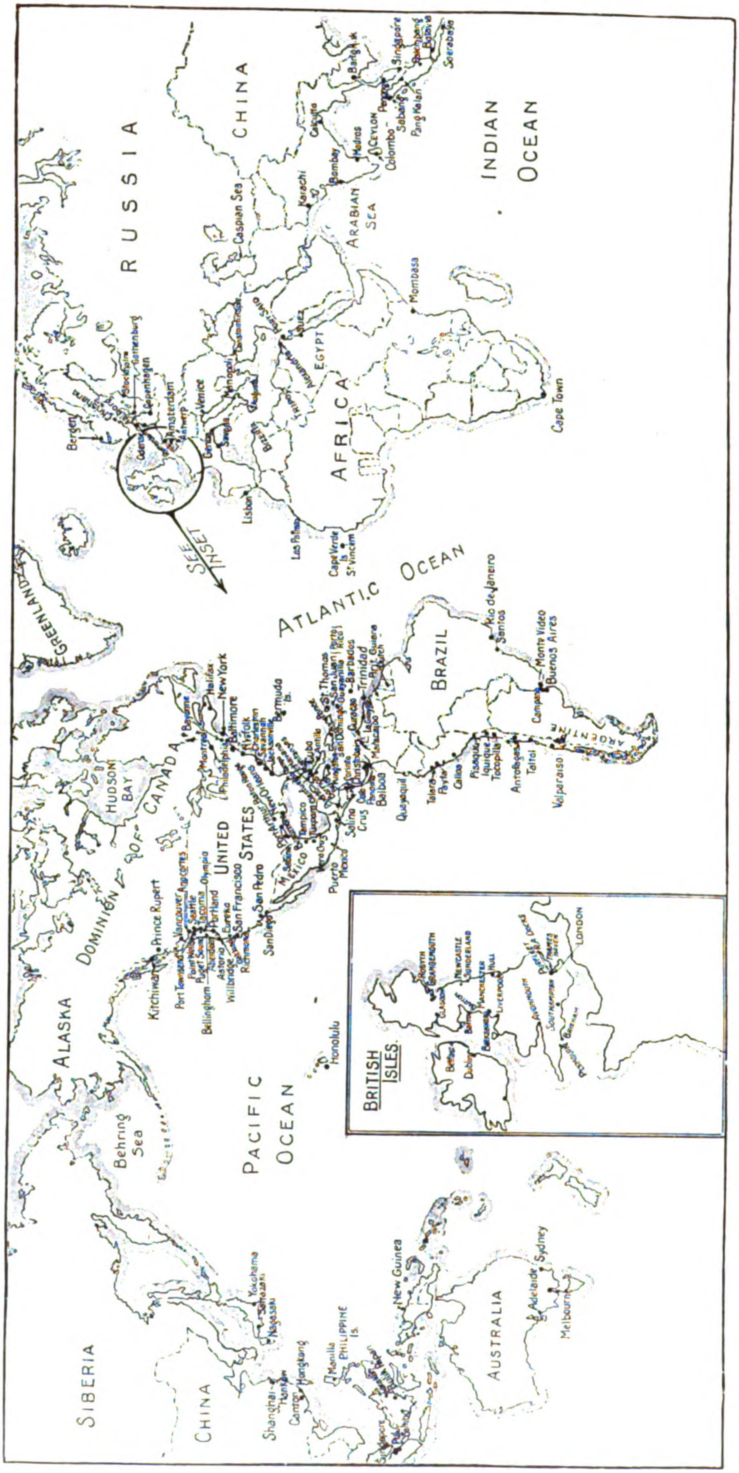
- Aalborg (Denmark)
- Aarhus
- Abadan (Persia)
- Aberdeen
- Adelaide
- Aden
- Ajaccio
- Alexandria
- Algiers
- Almeria
- Amoy (China)
- Amsterdam
- Ango-Ango (Congo)
- Antilla
- Antofagasta (Chile)
- Antwerp
- Aomori
- Arica (Chile)
- Astoria
- Augusta (Sicily)
- Avonmouth
- Azores (Ponta Delgada)
- Bahia Blanca (Arg.)
- Bahia (Brazil)
- Balbo (Panama)
- Balik Pappan (Borneo)
- Baltimore
- Bangkok (Siam)
- Barcelona
- Barranquilla (Colombia)
- Barrow
- Batavia
- Baton Rouge (La.)
- Batum
- Bayonne, N.J.
- Beaumont (Texas)
- Beira
- Belfast
- Belize (Honduras)
- Bergen
- Bermuda
- Bilbao
- Birkenhead
- Bizerta (Tunis)
- Boelbaai Ceram
- Boma (Congo)
- Bombay
- Bordeaux
- Boston (U.S.A.)
- Bourgas (Turkey)
- Bremen
- Brest
- Bridgetown (Barbadoes)
- Brighton (Trinidad)
- Brixham
- Brunsbuettel-Ostermoor
- Brunswick
- Buenos Aires
- Cadiz
- Calcutta
- Caleta Buena (Chile)
- Callao
- Campana
- Canton
- Cape Town
- Cardiff
- Casablanca
- Cebu (Philippines)
- Ceram (D.E.I.)
- Ceuta
- Charleston
- Cherbourg
- Chittagong (India)
- Christiania
- Cienfuegos (Cuba)
- Civita Vecchia
- Claxton Bay (Trinidad)
- Cochin (India)
- Colombo
- Colon (Pan. Canal)
- Conception del Uruguay
- Constanza
- Constantinople
- Copenhagen
- Corinto (Nicaragua)
- Corunna
- Cristobal
- Curacao
- Destreban
- Donges
- Dover
- Dublin
- Dunkirk
- Durban
- Emden
- Eten (Peru)
- Falmouth
- Fall River (Mass.)
- Fayal
- Ferrol
- Folkestone
- Foochow
- Fort William (Ont.)
- Foynes
- Fredericia
- Fremantle
- Funchal
- Galveston
- Gemsah
- Genoa
- Georgetown
- Gibraltar
- Glasgow
- Gothenburg
- Granatello (Italy)
- Graney Island (Va.)
- Grangemouth
- Granton
- Guayaquil
- Gulf Port (Miss.)
- Halifax (Canada)
- Hamburg
- Hamilton (Ont.)
- Hankow
- Harwich
- Havana
- Havre
- Helsingfors
- Hong Kong
- Honolulu
- Houston (Texas)
- Hull
- Hurghada
- Ichang (China)
- Ilo Ilo (Philip. Is.)
- Immingham
- Iquique (Chile)
- Itosaki
- Jacksonville (Fla.)
- Jarrow-on-Tyne
- Junin (Chile)
- Karachi
- Ketchikan
- Kettle Point (R.I.)
- Key West
- Kiel
- Kingston (Jamaica)
- Kobe
- La Guayra (Venez.)
- La Pallice
- La Rochelle
- Las Palmas
- Leghorn
- Leith
- Levis
- Lisbon
- Liverpool
- Lobitos
- London:
  - Thameshaven, Purfleet, etc.
- Lorient
- Los Angeles
- Lourenço Marques
- Macassar (Celebes)
- Madras
- Malmo
- Malta
- Manati (Cuba)
- Manchester Ship Canal
- Manila
- Maracaibo (Venez.)

Marmagoa (India)
Marseilles
Mantanzas (Cuba)
Mauritius
Mejillones (Chile)
Melbourne
Middlesbrough
Minatitlan (Mexico)
Miri
Mobile (Alabama)
Mollendo (Peru)
Mombasa
Monopoli
Montevideo
Montreal
Nagasaki
Naples
Neuvitas
Newcastle-on-Tyne
New Orleans
New York
Niigata (Japan)
Nonai
Nordenham
Norfolk (Va.)
Nyborg
Odense (Denmark)
Oleum (Cal., U.S.A.)
Oran
Paitaz (Peru)
Pago Pago (Samoa)
Palembang (Sumatra)
Palermo
Palo Blanco (Mex.)
Pangkalan - Berandan
Papeete (Tahiti)
Para (Brazil)
Paramaribo (Dutch Guiana)
Passaic (N.J.)
Payta
Penang
Pensacola (Florida)
Perim
Pernambuco
Philadelphia
Piræus
Pisagua
Plymouth
Point à Pierre (Trinidad)
Point Fortin (Trinidad)
Point Wells
Ponce
Ponta Delgada (Azores)
Port Arthur (Texas)
Port Edgar
Portici
Portishead
Portland (Maine)
Portland (Ore.)
Port of Spain
Port St. Luis du Rhone (France)
Port Said
Port Sudan
Prince Rupert (B.C.)
Providence (R.I.)
Puerto Barrios (Guatemala)
Puerto Cabello (Venez.)
Puerto Mexico
Puloe Samboe
Pulo Bukom
Quebec
Regla (Cuba)
Richmond (Va.)
Rangoon
Rio de Janeiro
Rochefort
Rotterdam
Rouen
Sabine
Sabang
Saigon (French Cochin China)
Saitozaki
St. Georges
St. John (N.B.)
St. Nazaire
St. Thomas
St. Vincent
Salina Cruz (Mex.)
Salinas (Chili)
Salonica
San Antonio (Chile)
San Diego
San Domingo
San Francisco
San Juan (P. Rica)
San Luis Obispo (Cal., U.S.A.)
San Pedro (Cal.)
Santander
Santos (Brazil)
Sarnia
Savannah
Savona
Seattle (Wash.)
Shanghai
Singapore
Smyrna
Soerabaya (Java)
Southampton
South Shields
Spezia
Stavanger
Stettin
Stockholm
Strasburg
Suez
Sunderland
Supe (Peru)
Svolvaer (Norway)
Swansea
Swatow (China)
Sydney
Tacoma
Talara (Peru)
Taltal (Chile)
Tambes (Peru)
Tampa (Florida)
Tampico (Mexico)
Tarakan (Borneo)
Teneriffe
Tientsin
Tocopilla (Chile)
Toronto
Toulon
Trieste
Trinidad
Trondjhem
Tsuchizaki (Japan)
Tunis
Tuticorin (India)
Tuxpam (Mexico)
Vado
Vallo (Norway)
Valparaiso
Vancouver
Venice
Vera Cruz (Mexico)
Victoria (B.C.)
Wellington (N.Z.)
Willbridge
Willemstad (Curacao)
Yati (Paraguay)
Yokohama
Zanzibar

NUMBER AND TONNAGE OF MOTOR VESSELS (INCLUDING VESSELS FITTED WITH AUXILIARY MOTORS) OWNED BY VARIOUS NATIONS.

	June, 1921.		June, 1922.		June, 1923.	
	No.	Gross tonnage.	No.	Gross tonnage	No.	Gross tonnage.
United Kingdom	180	263,128	214	355,461	221	393,283
British Dominions	104	50,104	99	36,973	112	38,262
United States	173	188,125	147	188,283	168	192,595
Denmark	96	150,202	104	165,810	112	160,034
Holland	89	50,262	95	75,684	96	76,322
France	68	43,235	65	33,656	69	42,737
Germany	69	16,688	99	73,127	97	108,662
Italy	65	64,791	91	88,330	98	93,274
Japan	7	6,654	8	6,090	146	29,312
Norway	233	157,313	240	197,973	226	213,438
Russia	15	8,511	—	—	—	—
Spain	34	14,522	47	18,104	49	23,762
Sweden	167	137,329	160	166,679	196	194,337
Other countries	152	96,357	224	134,293	205	100,367
World's total	1,452	1,247,221	1,593	1,540,463	1,795	1,666,385

MAP OF THE WORLD, SHOWING PRINCIPAL PORTS WHERE OIL STORAGE IS PROVIDED.



(Reprinted from "The Motor Ship.")

PRODUCTION OF CRUDE OIL IN VARIOUS REGIONS.

Country.	Production of Crude Petroleum in—								
	1880.	1890.	1900.	1910.	1913.	1919.	1920.	1921.	1922.
North America:	Tons	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Atlantic Seaboard .	3,550,000	6,170,000	7,940,000	16,750,000	18,170,000	34,770,000	42,890.000	44,581,000	51,068,000
Pacific Seaboard .	10,000	50,000	670,000	11,230,000	15,040,000	15,630,000	16,260,000	18,063,000	22,449,000
Mexico	—	—	—	540,000	3,840,000	13,000,000	24,330,000	28,865,000	27,620,000
Trinidad	—	—	—	20,000	70,000	260,000	300,000	330,000	340,000
South America:									
Atlantic Seaboard .	—	—	—	—	20,000	210,000	280,000	471,000	742,000
Pacific Seaboard .	—	—	40,000	180,000	280,000	350,000	370,000	493,000	756,000
Asia:									
India, East Indies, Persia, Japan, etc.	—	30,000	570,000	2,610,000	3,100,000	4,760,000	5,160,000	6,394,000	6,791,000
Africa:									
Egypt	—	—	—	—	10,000	230,000	150,000	179,000	170,000
Europe:									
Russia	410,000	3,930,000	10,380,000	9,640,000	8,610,000	4,580,000	3,520,000	3,993,000	4,807,000
Roumania . . .	20,000	50,000	230,000	1,310.000	1,870,000	920,000	1,030,000	1,145,000	1,347,000
Elsewhere . . .	30,000	110,000	380,000	1,920,000	1,240,000	920,000	850,000	795,000	721,000
Total	4,020,000	10,340,000	20,210,000	44,200,000	52,250,000	75,630,000	95,140,000	105,309,000	116,811,000
Percentages of increase	425 over 1870	157·2 over 1880	95·3 over 1890	118·8 over 1900	18·2 over 1910.	44·9 over 1913	26 over 1919 or 117 over 1910	10·7 over 1920	10·9 over 1921

Note.—The figures in the above table may be taken as approximately accurate, allowing for the more or less exact methods of various tabulators, *e.g.* in converting "barrels" to tons, etc. This is often done roughly by taking seven barrels to the ton without reference to the varying specific gravities of particular oils. The later figures for Russia, and in one or two other instances where authoritative returns are not published, have had to be partly estimated.

HIGHEST AND LOWEST IRON AND STEEL PRICES FOR THE YEARS 1914-1923.

	1914.			1915.			1916.			1917.			1918.			1919.			1920.			1921.			1922.			1923 (to September).		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Marked Iron Bars, S. Staffs	9	0	0	13	0	0	15	10	0	15	10	0	20	0	0	25	10	0	33	10	0	33	10	0	16	0	0	14	10	0
	8	10	0	9	0	0	13	10	0				14	15	0	18	0	0	26	15	0	16	0	0	13	10	0	13	10	0
Common Iron Bars, Cleveland	8	2	6	13	2	6	15	0	0	15	0	0	20	0	0	23	0	0	30	0	0	27	10	0	13	0	0	12	0	0
	7	10	0	8	0	0	13	0	0	13	15	0	14	15	0	15	10	0	24	5	0	12	10	0	10	10	0	10	10	0
Steel Ship Plates, ⅜-in., Middlesbrough	7	10	0	11	0	0	14	5	0	13	10	0	16	10	0	22	0	0	24	10	0	24	0	0	10	10	0	10	10	0
	7	0	0	8	0	0	11	0	0	11	10	0	11	10	0	11	10	0	20	0	0	10	10	0	9	0	0	9	0	0
Steel Ship Angles, Middlesbrough	7	5	0	10	15	0	18	2	6	18	2	6	16	2	6	18	5	0	24	0	0	24	0	0	10	0	0	10	0	0
	6	15	0	7	15	0	10	15	0	11	2	6	11	2	6	11	2	6	19	10	0	10	0	0	8	12	6	8	10	0
Steel Ship Plates, Glasgow	7	5	0	11	17	6	13	15	0	14	15	0	16	10	0	23	15	0	28	5	0	25	10	0	10	10	0	10	15	0
	6	17	6	7	2	6	11	10	0	11	10	0	11	10	0	11	10	0	21	10	0	10	10	0	8	5	0	8	15	0
Steel Ship Angles, Glasgow	7	0	0	12	10	0	18	2	6	18	2	6	18	2	6	19	5	0	26	10	0	24	10	0	10	0	0	11	5	0
	6	7	6	7	0	0	11	2	6	11	2	6	11	2	6	11	2	6	19	10	0	11	0	0	8	5	0	8	5	0
Steel Boiler Plates, Middlesbrough	8	5	0	13	0	0	14	10	0	14	10	0	17	10	0	23	0	0	31	0	0	31	0	0	14	10	0	14	0	0
	8	0	0	8	5	0	12	10	0	12	10	0	12	10	0	12	10	0	23	0	0	14	10	0	12	10	0	12	0	0
Steel Boiler Plates, Glasgow	7	5	0	12	17	6	14	15	0	15	5	0	17	10	0	24	10	0	31	10	0	31	10	0	14	10	0	14	0	0
	7	0	0	7	2	6	12	10	0	12	10	0	12	10	0	12	10	0	24	0	0	14	0	0	12	10	0	12	0	0

HIGHEST AND LOWEST FUEL OIL PRICES FOR THE YEARS 1914-1923.

	1914.			1915.			1916.			1917.			1918.			1919.			1920.			1921.			1922.			1923 (to September).		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Heavy	3	2	0	5	6	0	8	0	0	11	5	0	8	10	0	6	10	0	13	0	0	8	0	0	3	15	0	3	10	0
	2	5	0	2	10	0	7	0	0	9	0	0							9	17	6	3	15	0	3	0	0	3	0	0
Light	3	10	0	5	19	0	9	0	0	16	10	0	9	10	0	7	10	0	15	0	0	11	0	0	5	5	0	4	5	0
	2	15	0	3	0	0	7	5	0	10	0	0							11	5	0	5	5	0	4	0	0	4	0	0

"EXPORTS" OF NEW SHIPS FROM THE UNITED KINGDOM.

Ships not Registered as British, with their Machinery.

Year.	War Vessels.	Steam Ships (other than War Vessels).		Sailing Ships (other than War Vessels) including Boats.	Total of New Ships.
		Hulls and Fittings.	Machinery.		
	£	£	£	£	£
1903	74,480	2,798,737	1,222,108	188,504	4,283,829
1904	388,600	2,570,835	1,164,779	330,937	4,455,151
1905	50,000	3,693,422	1,516,183	171,693	5,431,298
1906	2,800,000	3,973,873	1,668,592	201,706	8,644,171
1907	554,700	6,586,449	2,550,702	326,262	10,018,113
1908	1,879,994	5,902,428	2,505,280	189,773	10,567,475
1909	247,000	3,698,556	1,819,618	161,940	5,927,114
1910	4,894,500	2,553,427	1,209,119	113,158	8,770,204
1911	25,000	3,745,349	1,632,402	259,564	5,663,115
1912	765,000	4,243,308	1,750,351	268,503	7,027,162
1913	2,617,100	5,867,179	2,336,509	205,742	11,026,530
1914	308,385	4,716,226	1,784,900	123,043	6,932,554
1915	—	1,170,606	472,597	49,548	1,692,661
1916	20,000	754,372	481,703	34,510	1,290,585
1917	—	706,084	347,354	33.869	1,087,307
1918	—	778,525	229,292	39,517	1,047,334
1919	—	1,703,961	505,652	118,718	2,328,331
1920	—	26,280,243		295,771	26,576,016
1921	—	29,523,833		470,615	29,994,448
1922	—	30,222,080		220,435	30,442,515
1923 (to Aug.)	—	8,789,011		110,696	8,899,707

STATEMENT SHOWING THE VALUE OF THE IMPORTS FOR HOME CONSUMPTION AND EXPORTS OF DOMESTIC PRODUCE OF THE PRINCIPAL COUNTRIES FOR THE YEARS 1913, 1921, AND 1922.

(Foreign currencies converted to sterling at par.)

Countries.	Imports.			Exports.		
	1913.	1921.	1922.	1913.	1921.	1922.
	Thousand £.	Thousand £.	Thousand £.	Thousand £	Thousand £.	Thousand £.
United Kingdom	652,692	979,635	1,003,918	524,532	703,196	720,496
United States	366,012	522,714	703,083	510,060	912,297	850,506
France	336,852	941,939	947,661	275,208	862,124	818,477
Netherlands	325,236	186,685	167,347	255,456	114,133	100,845
Belgium	165,460	402,057	359,917	145,380	285,593	240,269
Italy	145,824	538,181	623,582	100,464	211.267	368,641
Canada	135,648	164.337	172,124	89,664	164,999	180,510
British India	122,220	292,051	226,388	160,836	215,113	279,240
Switzerland	74,376	89,900	75,932	54,864	70,534	67,010
Japan	74,076	163,803	193,172	64,260	126,380	167,087
Brazil	67,164	60,468	110,175	65,448	58,587	155.472
Spain	52 248	50,430	120,416	42,300	31,934	57,625
Denmark	43,188	90,835	82,920	35,412	76,855	64,628
Union of South Africa	40,380	61,019	47,228	27,528	24.273	57,026
New Zealand	21,420	42,744	35,013	21,048	42,937	42,726

STATEMENT SHOWING THE ENTRANCES AND CLEARANCES IN THE FOREIGN TRADE OF THE UNDERMENTIONED COUNTRIES FOR THE YEARS 1913, 1921, AND 1922.

Note.—C = With Cargo only. C & B = With Cargo and in Ballast.

Countries.		Entrances.			Clearances.		
		1913.	1921.	1922.	1913.	1921.	1922.
		Thousand tons net.	Thousand tons net.	Thousand tons net.	Thousand tons net.	Thousand tons net.	Thousand tons net.
United Kingdom	C	49,068	37,176	43,326	67,824	36,384	59,680
United States of America	C & B	53,280	62,184	65,196	53,796	62,592	64,836
France	C	34,512	27,300	44,315	26,112	21,624	44,335
Japan	C & B	24,720	27,984	35,795	24,900	27,888	35,557
Netherlands	C	17,148	12,204	15,972	11,016	9,876	10,464
Spain	C & B	25,788	20.028	20,304	28,992	15,984	17,496
British India	C	6,700	6,624	6,780	8,256	6,480	7,320
Australia	C & B	5,364	4,572	4,752	5,232	4,644	4,632
South Africa	C & B	5.352	4,200	4,488	5,280	4,176	4,416
Norway	C	3,756	2,232	2,892	4,740	3,480	3.300
Belgium	C	16,908	14,580	17,172	16,896	14.328	17,256
Sweden	C & B	13,764	8,124	10,572	17,004	8,100	10,752
Brazil	C & B	29,172	22,512	22,380	29,208	22.392	22,392

Above as Percentages of 1913 Figures.

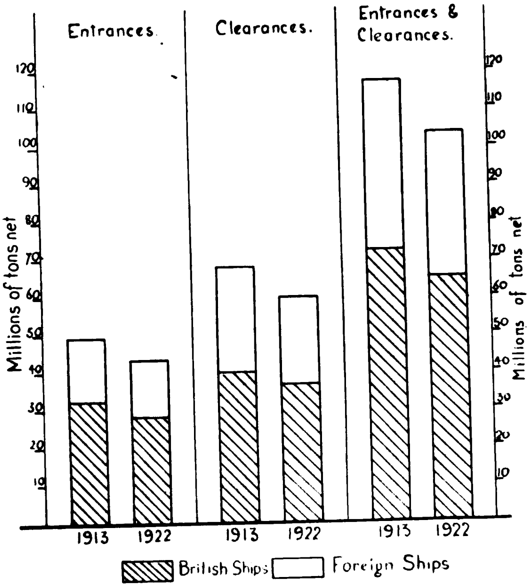
United Kingdom	100	76	88	100	54	88
United States of America	100	117	122	100	116	104
France	100	79	129	100	83	170
Japan	100	113	145	100	112	135
Netherlands	100	71	93	100	90	95
Spain	100	78	79	100	55	60
British India	100	98	101	100	78	89
Australia	100	85	89	100	89	89
South Africa	100	78	84	100	79	84
Norway	100	59	77	100	73	70
Belgium	100	86	102	100	85	102
Sweden	100	59	77	100	48	63
Brazil	100	77	77	100	77	77

STATEMENT SHOWING THE NATIONALITY AND NET TONNAGE OF VESSELS WHICH ENTERED AND CLEARED WITH CARGOES IN THE FOREIGN TRADE OF THE UNITED KINGDOM FOR THE YEARS 1913 AND 1922. (*See diagram below.*)

Nationality	Entrances.		Clearances.		Percentages			
					Entrances.		Clearances.	
	1913.	1922.	1913.	1922.	1913.	1922.	1913.	1922.
	Tons.*	Tons.*	Tons.*	Tons.*				
British	32,291	28,422	40,102	36,815	65·8	65·6	59·1	61·7
Foreign :—								
Norwegian . . .	3,285	2,399	4,683	3,729	6·7	5·5	6·9	6·2
United States of America . . .	724	2,900	370	1,531	1·5	6·7	0·5	2·6
Swedish	1,891	1,369	3,016	1,884	3·9	3·2	4·5	3·2
Dutch . . .	1,702	2,040	2,536	3,469	3·5	4·7	3·7	5·8
Danish	1,161	1,165	2,613	1,974	2·4	2·7	3·9	3·3
French	999	1,229	1,975	2,955	2·0	2·8	2·9	5·0
Belgian	1,369	788	957	1,095	2·8	1·8	1·4	1·8
Japanese	140	467	282	525	0·3	1·1	0·4	0·9
Spanish	1,060	734	1,694	1,221	2·2	1·7	2 5	2·0
Italian	122	194	955	1,176	0·2	0·4	1·4	2·0
Russian	678	32	937	43	1·4	0·1	1·4	0·1
Greek	221	175	1,072	795	0·4	0·4	1·6	1·3
German	3,166	788	5,730	1,491	6·4	1·8	8·5	2·5
Austro-Hungarian .	128	624	715	977	0·3	1·4	1·0	1·6
Other Nationalities	125		185		0 2		0·3	
Total Foreign .	16,772	14,904	27,719	22,865	34·2	34 3	40·9	38·3
Total British and Foreign . .	49,063	43,326	67,821	59,680	100·0	100·0	100·0	100·0

	Entrances and Clearances.		Percentages.	
	1913.	1922.	1913.	1922.
	Tons.*	Tons.*		
British	72,393	65,237	62	63
Foreign	44,490	37,769	38	37
Total . . .	116,883	103,006	100	100

* *Figures in thousands*, i.e. *hundreds omitted.*

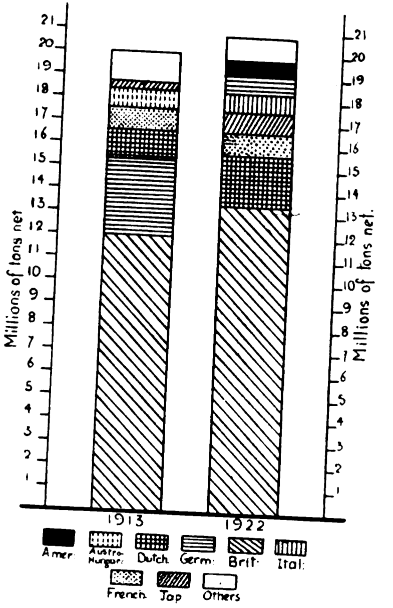


STATEMENT SHOWING THE NUMBER AND NET TONNAGE OF VESSELS THAT PASSED THROUGH THE SUEZ CANAL IN THE YEARS 1913 AND 1922, DISTINGUISHING THE PRINCIPAL NATIONALITIES.

Nationality of Vessels.	Number of Passages.		Net Tonnage of Vessels.		Numbers as Percentages of Total.		Tonnages as Percentages of Total.	
	1913.	1922.	1913.	1922.	1913.	1922.	1913.	1922.
British	2951	2736	12,052,484	13,382,710	58·0	63·0	60·2	64·5
Japanese . . .	68	170	343,722	928,386	1·3	3·9	1·7	4·5
Dutch	342	455	1,287,354	2,161,471	6·7	10·5	6·4	10·4
French	256	215	927,787	996,875	5·0	4·9	4·6	4·8
Italian	110	225	290,576	858,011	2·2	5·2	1·5	4·1
Danish	56	61	171,848	279,838	1·1	1·4	0·9	1·3
Norwegian . . .	44	79	93,313	308,711	0·9	1·8	0·5	1·5
American (U.S.) .	8	137	7,476	668,213	0·2	3·2	—	3·2
Swedish	33	55	122,957	242,413	0·7	1·3	0·6	1·2
Greek	17	10	54,560	31,929	0·3	0·2	0·3	0·2
Spanish	26	16	75,643	46,437	0·5	0·4	0·4	0·3
German	778	149	3,352,287	735,129	15·3	3·4	16·7	3·5
Austria-Hungarian	246	—	845,830	—	4·8	—	4·2	—
Russian	110	12	340,595	40,938	2·2	0·3	1·7	0·2
All others . . .	40	25	67,422	62,184	0·8	0·5	0·3	0·3
Total . .	5085	4345	20,033,802	20,743,245	100·0	100·0	100·0	100·0

NOTE.—The above figures include not only Merchant Vessels and Mail Steamers, but also Warships and Transports as well as Government Chartered Vessels.

NET TONNAGE AND NATIONALITIES OF VESSELS PASSED THROUGH THE SUEZ CANAL, 1913 AND 1922.



STATEMENT SHOWING THE NUMBER AND NET TONNAGE OF COMMERCIAL VESSELS THAT PASSED THROUGH THE PANAMA CANAL IN THE YEARS ENDED 30TH JUNE, 1917, 1918, 1919, 1920, 1921, 1922, AND 1923, DISTINGUISHING THE PRINCIPAL NATIONALITIES.

NOTE.—Commercial Vessels include all Vessels except those of the United States Government, or chartered by the U.S. Government to carry Government supplies, and Vessels of less than 10 tons measurement).

Nationality.	Number of Vessels.							Net Tonnage of Vessels.						
	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1917.	1918.	1919.	1920.	1921.	1922.	1923.
British	780	702	607	753	972	935	1,065	2,663,250	2,529,203	1,915,744	2,760.188	3,978,329	3,795,526	4,892,338
American (U.S.A.)*	404	567	784	1,129	1,210	1095	1,994	1,239,492	1,704,040	2,257,342	3,791,088	4,861,761	4,971,509	10,208,536
Norwegian . . .	145	296	128	106	140	113	147	490,534	876,024	497,555	397.632	548,227	385,007	597,359
Japanese	72	54	87	118	136	189	163	291,500	238,814	341,064	515,243	613,245	872.466	753,219
Chilian	99	96	93	79	63	53	62	265,210	254,841	253,561	212,000	159,727	150,398	201,411
Danish	43	100	79	9	60	53	65	163,882	272.946	213.534	32,221	236,512	227,473	240,053
Peruvian	86	83	64	75	60	60	80	218,593	208,958	166,956	191,689	157,495	161,930	216,829
Dutch	74	48	19	29	50	66	109	260,500	197,627	88,299	152,535	248.801	293,428	510,970
French	9	52	104	60	44	51	56	38,889	147,805	253,774	114.664	155,889	190,171	252,333
Spanish	20	11	5	41	44	9	14	49.124	24.469	11,066	106,651	117,400	27,264	41.201
Other Nationalities	71	60	54	79	113	112	212	117,583	119,346	126,095	272,133	338,490	342,287	691,537
Totals . . .	1,803	2,069	2,024	2,478	2,892	2,736	3,967	5,798,557	6,574,073	6,124,990	8,546,044	11,415,876	11,417,459	18,605,786

ABOVE AS PERCENTAGES.

	1917.	1918.	1919.	1920.	1921.	1922.	1923.	1917.	1918.	1919.	1920.	1921.	1922.	1923.
British	43·3	33·9	30·0	30·4	33·6	34·2	26·8	45·9	38·5	31·3	32·3	34·8	33·3	26·3
American (U.S.A.)*	22·4	27·4	38·7	45·6	41·8	40·0	50·3	21·4	25·9	36·8	44·4	42·6	43·5	54·9
Norwegian . . .	8·0	14·3	6·3	4·3	4·9	4·1	3·7	8·5	13·3	8·1	4·7	4·8	3·4	3·2
Japanese . . .	4·0	2·6	4·3	4·8	4·7	6·9	4·1	5·0	3·6	5·6	6·0	5·4	7·6	4·0
Chilian	5·5	4·7	4·6	3·2	2·2	2·0	1·6	4·6	3·9	4·1	2·5	1·4	1·3	1·1
Danish	2·4	4·8	3·9	0·3	2·1	2·0	1·6	2·8	4·2	3·5	0·4	2·1	2·0	1·3
Peruvian	4·8	4·0	3·2	3·0	2·1	2·2	2·0	3·8	3·2	2·7	2·2	1·4	1·4	1·2
Dutch	4·1	2·3	0·9	1·2	1·7	2·4	2·7	4·5	3·0	1·4	1·8	2·2	2·6	2·7
French	0·5	2·5	5·1	2·4	1·5	1·8	1·4	0·7	2·2	4·2	1·3	1·4	1·7	1·4
Spanish	1·1	0·6	0·3	1·6	1·5	0·3	0·3	0·8	0·4	0·2	1·2	1·0	0·2	0·2
Other Nationalities	3·9	2·9	2·7	3·2	3·9	4·1	5·5	2·0	1·8	2·1	3·2	2·9	3·0	3·7
Totals . . .	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0

* Includes Vessels engaged in the coasting trade of the U.S.A., which is carried on *entirely* by National Ships.

Statement showing (in tons weight) the Cargoes carried in Commercial Vessels that passed through the Panama Canal during the Years ended 30th June, 1917, 1918, 1919, 1920, 1921, 1922, and 1923, distinguishing the Principal Nationalities.

Nationality of Vessels.	Weight of Cargoes carried.						
	1917.	1918.	1919.	1920.	1921.	1922.	1923.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
British	3,393,750	2,615,675	1,876,939	2,830,268	3,738,257	3,329,861	4,929,317
American (U.S.A.)	1,475,725	2,098,277	2,758,886	4,547,140	5,163,025	4,950,519	11,055,150
Norwegian . . .	597,581	1,090,823	577,679	404,323	637,887	408,268	704,292
Japanese . . .	446,358	407,399	503,427	726,338	758,617	1,044,515	943,400
Chilian	184,446	153,259	161,340	104,738	61,737	46,182	76,670
Danish	242,567	420,063	325,277	42,533	322,059	272,779	307,876
Peruvian . . .	159,609	143,344	121,524	119,418	105,322	64,370	111,519
Dutch	314,203	233,063	119,297	128,442	216,488	290,573	487,957
French	36,680	159,859	286,812	125,249	132,836	139,463	230,175
Spanish	71,080	35,394	10,047	101,563	143,076	23,701	32,178
Other Nationalities	136,564	174,875	175,393	244,487	319,910	314,679	689,341
Totals . . .	7,058,563	7,532,031	6,916,621	9,374,499	11,599,214	10,884,910	19,567,875

Above as Percentages.

—	1917.	1918.	1919.	1920.	1921.	1922.	1923.
British	48·1	34·7	27·1	30·2	32·2	30·6	25·2
American (U.S.A.)	20·9	27·9	39·9	48·5	44·5	45·5	56·5
Norwegian . . .	8·5	14·5	8·4	4·3	5·5	3·7	3·6
Japanese . . .	6·3	5·4	7·3	7·7	6·5	9·6	4·8
Chilian	2·6	2·0	2·3	1·1	0·5	0·4	0·4
Danish	3·4	5·6	4·7	0·5	2·8	2·5	1·6
Peruvian . . .	2·3	1·9	1·8	1·3	0·9	0·6	0·6
Dutch	4·5	3·1	1·7	1·4	1·9	2·7	2·5
French	0·5	2·1	4·2	1·3	1·2	1·3	1·2
Spanish	1·0	0·5	0·1	1·1	1·2	0·2	0·2
Other Nationalities	1·9	2·3	2·5	2·6	2·8	2·9	3·4
Totals . . .	100·0	100·0	100·0	100·0	100·0	100·0	100·0

COAL PRODUCTION AND DISTRIBUTION OF THE UNITED KINGDOM. (*See diagrams on page* 628.)

Year.	Total production. (Thousand tons.)	Home consumption. (Thousand tons.)	Exported * (Thousand tons.)	Bunkers. (Foreign trade.) (Thousand tons.)
1902	227,095	168,788	43,159	15,148
1903	230,334	168,584	44,950	16,800
1904	232,428	168,981	46,256	17,191
1905	236,129	171,256	47,477	17,396
1906	251,068	176,878	55,600	18,590
1907	267,831	185,602	63,610	18,619
1908	261,529	179,508	62,547	19,474
1909	263,774	180,983	63,077	19,714
1910	264,433	182,822	62,085	19,526
1911	271,892	188,029	64,599	19,264
1912	260,416	177,681	64,444	18,291
1913	287,412	192,980	73,400	21,032
1914	265,430	187,854	59,040	18,536
1915	253,179	196,013	43,535	13,631
1916	255,846	204,506	38,352	12,988
1917	248,041	202,817	34,996	10,228
1918	226,557	186,048	31,753	8,756
1919	229,037	181,766	35,250	12,021
1920	229,295	190,523	24,932	13,840
1921	164,344	128,757	24,661	10,926
1922	250,808	168,350	64,198	18,259

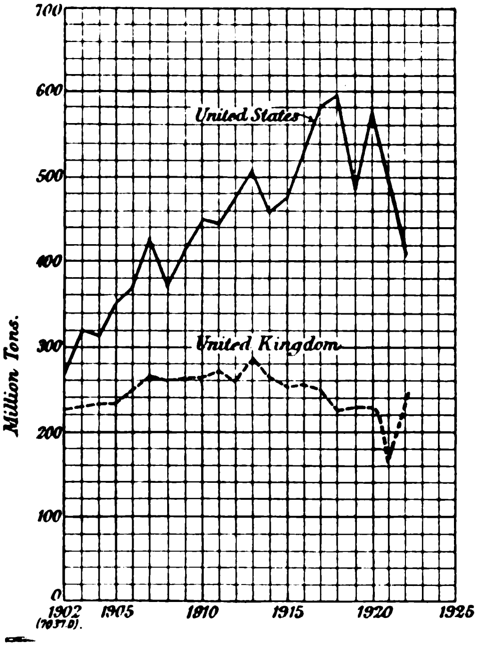
* Excluding coke and manufactured fuel.

COAL PRODUCTION AND DISTRIBUTION OF THE UNITED STATES. (*See diagrams on page* 628.)

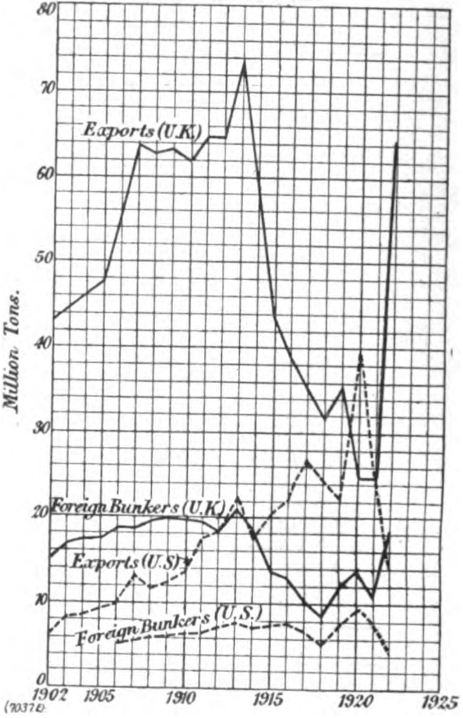
Year.	Total production.* (Thousand tons.)	Home consumption. (Thousand tons)	Exported. (Thousand tons.)	Bunkers. (Foreign trade.) (Thousand tons.)
1902	269,278	Figures not available	6,127	Figures not available
1903	321,067	,,	8,312	,,
1904	314,122	,,	8,573	,,
1905	350,645	,,	9,189	,,
1906	369,783	354,736	9,922	5,125
1907	428,895	409,988	13,153	5,754
1908	370,833	352,961	11,853	6,024
1909	411,469	392,813	12,537	6,119
1910	449,283	429,031	13,806	6,446
1911	443,188	419,088	17,433	6,667
1912	477,202	451,713	18,149	7,340
1913	508,893	479,051	22,141	7,701
1914	458,505	433,607	17,632	7,266
1915	474,660	446,884	20,305	7,471
1916	526,874	495,905	23,143	7,826
1917	581,610	548,078	26,649	6,883
1918	595,546	565,622	24,392	5,532
1919	487,639	457,847	22,449	7,343
1920	576,485	527,908	39,215	9,362
1921	494,915	462,539	24,829	7,547
1922	411,000	393,436	13,448	4,116

* Figures given include both anthracite and bituminous coal.

PRODUCTION OF COAL IN THE UNITED KINGDOM & THE UNITED STATES.



EXPORTS OF COAL FROM THE UNITED KINGDOM & THE UNITED STATES, ALSO QUANTITIES SUPPLIED FOR BUNKERING VESSELS IN FOREIGN TRADE.



PRICES OF BRITISH BUNKER COALS, 1914 TO 1923.

Class of Coal.	Average prices 1914.		Highest and Lowest Prices. 1915		1916		1917		1918		1919		1920		1921		1922		1923 (to Sept.)	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Durham Bunkers—	12	8½	30	0	42	6	26	6	75	0	100	0	120	0	60	0	25	0	36	0
(Tyne special) .			12	6	22	6	20	0	25	0	32	0	33	6	26	0	19	6	23	0
Durham Bunkers—	12	0½	25	0	39	0	24	0	65	0	90	0	115	0	52	0	23	0	33	0
(Tyne ordinary) .			10	3	18	0	16	0	24	0	31	0	32	0	24	0	19	0	20	0
Cardiff Bunkers—	9	6	23	6	34	0	21	6	28	6	85	0	97	6	55	0	23	0	32	6
Small (class 1) .			10	0	14	6	13	0	21	6	28	6	35	0	18	6	16	0	17	6
Cardiff Bunkers—	13	0	24	0	40	0	25	0	35	6	80	0	110	0	50	0	24	0	34	0
No. 2 through			12	0	15	6	16	6	23	6	35	6	50	0	20	0	18	0	18	6
South Derbyshire—	—		26	3	42	6	35	0	70	0	70	0	80	0	53	0	28	0	32	6
Steam hard . .			14	9	20	6	24	0	30	0	37	0	37	0	26	0	23	6	24	0
Yorkshire nuts—	12	7½	21	0	28	0	27	6	60	0	60	0	80	0	50	0	30	0	32	0
Doubles . . .			14	6	21	0	24	0	25	0	32	0	32	0	27	0	22	0	25	0
Scotch Navigation—	16	1½	26	0	40	0	32	6	70	0	95	0	97	6	75	0	28	6	32	0
f.o.b. Glasgow .			13	9	24	0	26	0	30	0	37	0	72	6	26	0	25	0	26	0
Scotch Navigation—	13	3	30	0	50	0	33	6	70	0	110	0	142	0	60	0	30	0	33	0
f.o.b. Fife Ports .			16	6	23	0	27	0	31	0	38	0	73	0	28	0	26	0	26	0
Best Lancashire—	—		—		26	0	27	6	65	0	47	6	50	0	47	6	26	6	28	0
Steam					21	6	23	0	27	6	34	6	37	6	24	0	20	0	20	0

STATEMENT SHOWING THE NATIONALITY AND NET TONNAGE OF VESSELS WHICH ENTERED AND CLEARED WITH CARGOES AND IN BALLAST IN THE FOREIGN TRADE OF THE UNITED STATES OF AMERICA FOR THE YEARS ENDED 30TH JUNE, 1913, AND 31ST DECEMBER, 1921. (*See diagram* A, *page* 630.)

Nationality.	Entrances.		Clearances.		Percentages.			
					Entrances.		Clearances.	
	1913.	1921.	1913.	1921.	1913.	1921.	1913.	1921.
	Tons.*	Tons.*	Tons.*	Tons.*				
American	13,073	31,185	13,946	30,181	25·8	50·1	27·3	48·2
British	24,532	19,726	24,289	20,224	48·5	31·7	47·5	32·3
Other Nationalities:—								
Austrian	438	—	424	—	0·9	—	0·8	—
Belgian	352	282	356	313	0·7	0·5	0·7	0·5
Danish	481	732	446	788	0·9	1·2	0·9	1·3
Dutch	1,049	1,352	1,077	1,410	2·1	2·2	2·1	2·3
French	1,027	1,402	1,034	1,435	2·0	2·3	2·0	2 3
German	4,578	121	4,587	119	9·0	0·2	9·0	0·2
Italian	838	1,336	802	1,586	1·7	2·1	1·6	2·5
Norwegian . . .	2,774	1,929	2,798	2,030	5·5	3·1	5·5	3·2
Portuguese . . .	14	58	15	53	—	0·1	—	0·1
Russian	130	8	130	5	0·2	—	0·2	—
Spanish	391	551	374	593	0·8	0·9	0·7	0·9
Swedish	60	466	65	479	0·1	0·7	0·1	0·8
Japanese	394	1,998	287	2,221	0·8	3·2	0·6	3·5
All other Nationalities	510	1,139	523	1,228	1·0	1·7	1·0	1·9
Total . . .	50,639*	62,285*	51,152*	62,665*	100·0	100·0	100 0	100·0

	Entrances and Clearances.			Percentage of Total		Percentage. Increase or Decrease.
	1913.	1921.	Difference.	1913.	1921.	
	Tons.*	Tons.*	Tons.*			
American . . .	27,018	61,366	Increase 34,348	27	49	Increase 127
British	48,821	39,940	Decrease 8,881	48	32	Decrease 18
Other Nationalities	25,952	23,634	Decrease 2,318	25	19	Decrease 9
Total . . .	101,791*	124,940*	Increase 23,149*	100	100	Increase 23

* *Figures in thousands,* i.e. *hundreds omitted.*

PROPORTION OF U.S.A. EXPORTS CARRIED IN BRITISH, AMERICAN, AND OTHER VESSELS, AS SHOWN BY THE CLEARANCES WITH CARGOES IN THE OVERSEAS TRADE OF THE UNITED STATES OF AMERICA. (*See diagram* B, *page* 630.)

—	Clearances with Cargoes.			
	1913.	Percentage 1913.	1921.	Percentage 1921.
	Net Tons.		Net Tons.	
British Vessels	21,825,638	49	17,843,000	37
American Vessels	10,917,760	25	19,627,000	40
All other Vessels	11,739,449	26	11,207,000	23
Total Clearances with Cargoes .	44,482,847	100	48,677,000	100

PERCENTAGE OF UNITED STATES IMPORTS AND EXPORTS CARRIED IN AMERICAN VESSELS.—(BY TEN-YEAR PERIODS GENERALLY.)

Fiscal Year.	By Sea (including all Great Lakes water-borne foreign Commerce).				By Land Vehicles. Value in Dollars.	Total by Land and Sea. Value in Dollars
	In American Vessels. Value in Dollars.	In Foreign Vessels. Value in Dollars.	Total. Value in Dollars.	Per cent. American Vessels.		
1821	113,210,462	14,358,235	127,559,679	88·7	—	—
1830	129,918,458	14,447,970	144,366,428	89·9	—	—
1840	198,424,609	40,802,856	239.227.465	82·9	—	—
1850	230,272,084	90,764,954	330,037,038	72·5	—	—
1860	507,247,757	255,040,793	762,288,550	66·5	—	—
1870	352,969,401	638,927,488	991,896,889	35·6	—	991,896,889
1880	258,346,577	1,244,265,433	1,482,612,011	17·4	20,981,393	1,503,593,404
1890	202,451,086	1,371,116,744	1,573,567,830	12·9	73,571,263	1,647,139,093
1900	195,084,192	1,894,444.424	2,089,528,616	9·3	154,895,650	2,224,424,266
1910	260,837,147	2,721,962,475	2,982,799,622	8·7	319,132,528	3,301,932,150
1913	381,032,496	3,392,028,429	3,773,060,925	10·1	505,831,459	4,278,892.384
1914	368,359,756	3,417,108,756	3,785,468,512	9·7	473,036,293	4,258,504,805
1915	571,931,912	2,420,693,563	3,992,625,475	14·3	450,133,605	4,442,759,080
1916	948,908,216	4,877,132,995	5,826,041,211	16·3	705,325,184	6,531,366,395
1917	1,452,086,468	6,367,408,665	7,819,495,133	18·6	1,129,908,446	8,949,403,579
1918	1,688,495,946	6,015,204,510	7,703,700,456	21·9	1,161,666,318	8,865,366.774
1919*	3,823,763,693	6,679,895,162	10,503,658,855	36·4	1,321,132,067	11,824,790,922
1920*	5,154,337,761	6,830,563,705	11,984,901,466	43·0	1,523,256,493	13,508,157,959
1921*	2,166,796,204	3,908,315,192	6,075,111,396	35·7	919,036,703	6,994,148,099
1922*	2,161,715.609	3,803,167,434	6,964,883,043	31·0	881,163,751	7.846,046,794

* Up to and including 1918 the statistics given are for years ended on June 30; from 1919 onwards they are given for calendar years.

DIAGRAM A.—SHOWING ENTRANCES AND CLEARANCES WITH CARGOES AND IN BALLAST OF BRITISH, AMERICAN, AND OTHER VESSELS IN THE FOREIGN OVERSEAS TRADE OF THE UNITED STATES, 1913 AND 1921.

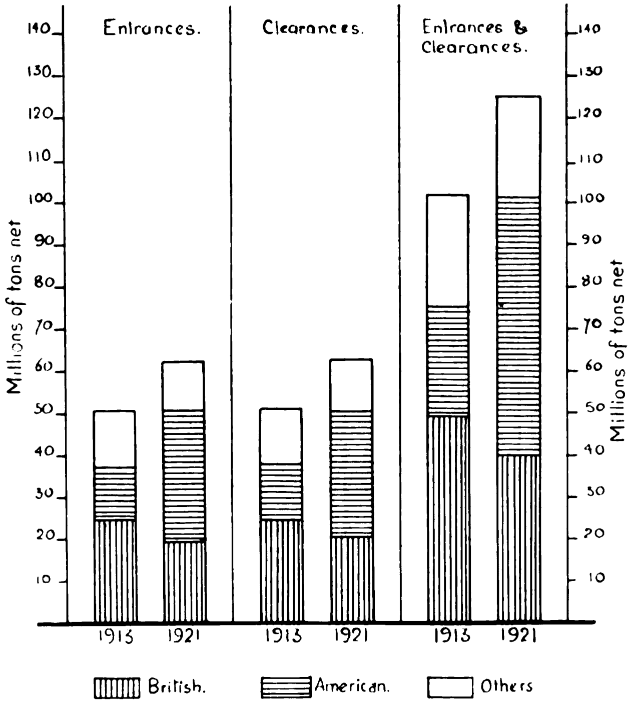
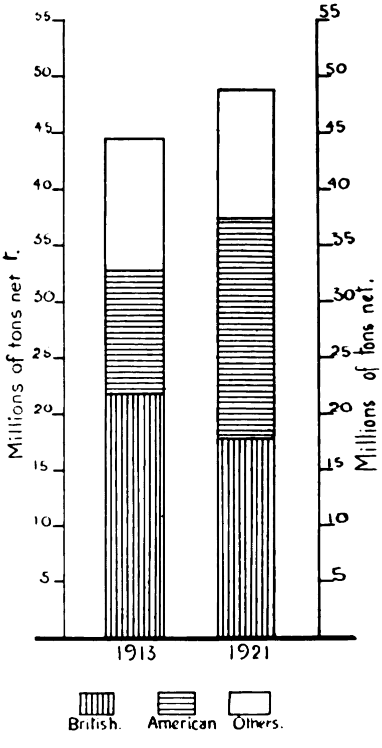


DIAGRAM B.—SHOWING THE PROPORTION OF U.S. SEABORNE EXPORTS CARRIED IN BRITISH, AMERICAN AND OTHER VESSELS, 1913 AND 1921.



FOREIGN TRADE OF THE UNITED STATES OF AMERICA

1913 AND 1922.

—	Imports.		Exports.		Imports and Exports.		Percentage of Total Imports.		Percentage of Total Exports.		Percentage of Total Imports and Exports.	
	1913.	1922.	1913.	1922	1913.	1922.	1913.	1922.	1913.	1922.	1913.	1922.
	Million $.	Million $.	Million $.	Million $.	Million $.	Million $.						
Overland	115.3	429.0	390.5	550.5	505.8	979.5	6·4	13·8	15·8	14·4	11·8	14·1
Oversea—												
In American vessels . .	193.1	900.3	187.9	1261.3	381.0	2161.6	10·6	28 9	7·6	32·9	8·9	31·1
In Foreign vessels . .	1504.6	1783.1	1887.5	2020.0	3392.1	3803.1	83·0	57·3	76·6	52·7	79·3	54·8
Total Oversea . .	1697.7	2683.4	2075.4	3281.3	3773.1	5964.7	93·6	86·2	84·2	85·6	88·2	85·9
Grand Total . .	1813.0	3112.4	2465.9	3831.8	4278.9	6944.2	100·0	100·0	100·0	100·0	100·0	100·0

FOREIGN TRADE OF THE UNITED STATES OF AMERICA.

STATEMENT SHOWING THE ENTRANCES AND CLEARANCES IN THE FOREIGN TRADE OF THE UNITED STATES OF AMERICA FOR THE YEARS 1913 AND 1922.

Nationality of Vessels.	Entrances.		Clearances.		Entrances and Clearances.		Percentages.					
							Entrances.		Clearances.		Entrances and Clearances.	
	1913	1922.	1913.	1922.	1913.	1922.	1913.	1922.	1913.	1922.	1913.	1922.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.						
American . . .	13,072,567	31,738,482	13,945,801	31,759,191	27,018,368	63,497,673	25·8	48·7	27·3	49·0	26·5	48·8
Foreign . . .	37,566,606	33,452,531	37,206,158	33,079,744	74,772,764	66,532,275	74·2	51·3	72·7	51·0	73·5	51·2
Total . .	50,639,173	65,191,013	51,151,959	64,838,935	101,791,132	130,029,948	100·0	100·0	100·0	100·0	100·0	100·0

BRITISH TECHNICAL SOCIETIES.

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Civil Engineers, Institution of: President, Sir Charles Morgan, C.B.E.; Hon. Secretary, J. H. T. Tudsbury, D.Sc.; Secretary, H. H. Jeffcott, B.A.I., Sc.D.; Telephone, Victoria 4577; Telegrams “Institution, London”: Address, Great George Street, Westminster, London, S.W. 1.

Civil Engineers of Ireland, Institution of: President, Prof. Pierce F. Purcell, M.A., M.A.I.; Hon. Secretary, L. Chalmer Smith: Address, 35, Dawson Street, Dublin.

Electrical Engineers, Institution of: President, Alexander Russell, M.A., D.Sc.; Secretary, P. F. Rowell; Telephone, Gerrard 764; Telegrams, “Voltampere, Phone, London”: Address, Savoy Place, Victoria Embankment, London, W.C. 2.

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Metals, Institute of: President, Professor T. Turner, M.Sc., A.R.S.M.; Treasurer, A. E. Seaton, Esq., M.Inst.C.E.; Secretary, G. Shaw Scott, M.Sc.; Telephone, Victoria 2320; Telegrams, “Victoria 2320”: Address, 36, Victoria Street, Westminster, London, S.W. 1.

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Newcomen Society for the Study of the History of Engineering and Technology: Hon. Secretary, H. W. Dickinson: Address, The Science Museum, South Kensington, London, S.W. 7.

North-East Coast Institution of Engineers and Shipbuilders: President, Sir Archibald C. Ross, K.B.E.; Secretary, E. W. Fraser-Smith; Telephone, Central 689; Telegrams, "Bolbec, Newcastle-on-Tyne": Address, Bolbec Hall, Newcastle-on-Tyne.

Royal Society for the Encouragement of Arts, Manufactures and Commerce: President, Field-Marshal H.R.H. The Duke of Connaught, K.G.; Chairman of Council, Lord Askwith, K.C.B., D.C.L.; Treasurers, Lord Blyth and William Henry Maw, LL.D., M.Inst.C.E.; Secretary, G. K. Menzies, M.A.: Address, John Street, Adelphi, London, W.C. 2.

Scientific Society of the Royal Technical College, The: President, J. H. Huntley, M.Inst.E.S.; Treasurer, J. E. Irvine; Secretary, Norman Young: Address, The Royal Technical College, Glasgow.

Structural Engineers, Institution of: President, Major James Petrie, O.B.E., M.Inst.T., F.P.W.I.; Secretary, Captain M. G. Kiddy, F.I.S.A.; Telephone, Victoria 2112; Telegrams, "Coninst, Churton, London"; Address, Denison House, 296, Vauxhall Bridge Road, London, S.W. 1.

COLONIAL AND FOREIGN TECHNICAL SOCIETIES.

CANADA.

National Association of Marine Engineers of Canada: Secretary, Neil J. Morrison: Address, Box 886, St, John, N.B.

FRANCE.

Association Technique Maritime: Address, Quai des Grands Augustins 55, Paris.

Bureau Veritas, International Register of Shipping: Address, 31, Rue d'Offémont, Paris.

GERMANY.

Schiffbautechnische Gesellschaft: Address, Schumann Str. 2pt., Geschäftsstelle, Berlin N.W. 6.

HOLLAND.

Koninklijk Institut van Ingenieur (Shipbuilding Section): Address, Prinsessegracht 23, The Hague.

ITALY.

Collegio Degli Ingegneri Navali e Meccanici in Italia (College of Naval Architects and Marine Engineers): President, Commander Angelo Scribanti: Address, Palazzo Nuova Borsa log. Genoa.

Italian Society of Naval and Mechanical Engineers: Address, Via Montallegro No. 1, Genoa.

JAPAN.

Japanese Society of Naval Architects: Address, 15, Yamashirocho Kyobashiku, Tokyo.

UNITED STATES.

American Institute of Electrical Engineers: President, H. J. Ryan; Secretary, F. L. Hutchinson: Address, 29, West 39th Street, New York, N.Y.

American Society of Civil Engineers: President, Charles F. Loweth; Secretary, John H. Dunlap: Address, 33, West 39th Street, New York, N.Y.

American Society of Marine Designers: Secretary, B. G. Barnes: Address, Kendrick Avenue, Quincy, Mass.

American Society of Mining and Mechanical Engineers: Address, 29, West 39th Street, New York, N.Y.

American Society of Naval Engineers: Secretary, Commander S. M. Robinson, U.S.N.: Address, Navy Department, Bureau of Engineering, Washington, D.C.

American Welding Society: Secretary, J. D. Connelly: Address, 1841, Oliver Building, Pittsburgh, Pa.

Bureau of Steam Navigation: Address, Navy Department, Washington, D.C.

Coast Artillery School: Manager, Major F. S. Clark, C.A.C.: Address, Fort Monroe, Va.

Franklin Institute: President, Walton Clark; Secretary, R. B. Owens: Address, 15, South 7th Street, Philadelphia, Pa.

Society of Naval Architects and Marine Engineers: President, Walter M. McFarland; Secretary-Treasurer, Daniel H. Cox: Address, 29, West 39th Street, New York, N.Y.

United States Naval Institute: Secretary and Treasurer, Lieut.-Commander G. M. Ravenscroft, U.S.N.: Address, Annapolis, Maryland.

Western Society of Engineers: President, Morris Knowles; Secretary, Kenneth F. Treschow: Address, William Penn Hotel, Pittsburg, Pa.

BRITISH NAVAL AND SHIPPING ORGANISATIONS.

Baltic Mercantile and Shipping Exchange: Chairman, Newton Dunn; Secretary, J. A. Findlay: Address, 24, St. Mary Axe, London, E.C. 3.

Belfast Shipowners' Association: Chairman, Sir George S. Clark, Bt.; Hon. Secretary and Hon. Treasurer, J. A. M. Heyn; Telephones, Belfast 2097-99; Telegrams, "Heyn, Belfast": Address, Head Line Buildings, Victoria Street, Belfast.

Boiler Makers and Iron Shipbuilders' Society: Chairman, Mark Hodgson: Vice-Chairman, C. W. Church; General Secretary, John Hill, J.P.; Assistant Secretary, Councillor John Barker: Address, Lifton House, Eslington Road, Newcastle-on-Tyne.

Bristol Steamship Owners' Association: Chairman, A. S. Ray; Vice-Chairman, G. F. Cullen; Acting Hon. Secretary, W. G. McCann; Telephone, Bristol 1836: Address, 18, St. Augustine's Parade, Bristol.

Britannia Steam Ship Insurance Association, Ltd.: Chairman, Sir Ernest W. Glover, Bt.; Managers, Tindall Riley & Co.: Address, 17, Gracechurch Street, London, E.C. 3.

British Corporation for the Survey and Registry of Shipping: Hon. President, Sir Archibald Denny, Bt., LL.D.; Chairman, Robert Clark; Vice-Chairman, Sir Wm. H. Raeburn, Bt., M.P.; Chief Surveyor, J. Foster King, C.B.E.; Secretary, John Fleming; Telephone Numbers, Cent. 8152 and 8153; Telegraphic Address, "Seaworthy, Glasgow": Address, 14, Blythswood Square, Glasgow.

British and Foreign Sailors' Society, Inc.: President, The Rt. Hon. Lord Radstock, C.B.E.; Treasurer, Sir Frederick Green, K.B.E.; Chairman, G. F. S. Edwards; Chairman of Finance, Sir Ernest Glover, Bart.; General Secretary, Herbert E. Barker; Organising Secretary, William J. Hawkey; Telephones, East 4350-1; Telegrams, "Sailordom, Step, London": Address, The Passmore Edwards Sailors' Palace, 680, Commercial Road, London, E. 14.

British Industries, Federation of: President, The Rt. Hon. Sir Eric Geddes, G.C.B., G.B.E.; Chairman, Sir Wm. B. Peat, C.V.O.; Deputy Chairman, Sir E. Fitzjohn Oldham; Director, R. T. Nugent; Secretary, D. L. Walker; Telephones, 6050-6056; Telegrams, "Fobusty, Piccy, London": Address, 39, St. James's Square, London, S.W. 1.

British Marine Salvage Co., The: Chairman, J. A. Roxburgh; Vice-Chairman, R. G. Service; Secretary and Treasurer, William Stewart: Address, Royal Exchange Buildings, Glasgow.

British Mercantile Marine (National Maritime Board): Chairmen, Sir F. Shadforth Watts and J. Havelock Wilson, C.H., C.B.E.; General Secretary, G. A Vallance; Telephone, Holborn 3074; Telegrams, "Joisec, London": Head Office, 3 and 4, Clements' Inn, London, W.C. 2.

British Sailing Ship Owners' Association, Ltd.: Chairman, A. W. Daniels; Vice-Chairman, J. H. Stokes; Secretary, H. M. Cleminson: Address, 24, St. Mary Axe, London, E.C. 3.

British Shipowners' Mutual Protection and Indemnity Association, Ltd.: Managers, A. Bilbrough & Co., Ltd.: Address, 23, Rood Lane, London, E.C. 3.

Cardiff and Bristol Channel Incorporated Shipowners' Association: Chairman, W. E. Hinde; Vice-Chairman, W. T. Gould; Secretary, W. R Hawkins; Telephone, Cardiff, 242; Telegrams, "Ships, Cardiff": Address, 6, The Exchange, Cardiff.

Chamber of Shipping of the United Kingdom: President, Sir Ernest Glover, Bt.; Vice-President, Sir Alan Anderson; General Manager, H. M. Cleminson; Assistant General Manager, P. M. Hill; Telephone, Avenue 7360; Telegrams, "Logboard, Stock, London": Address, 28, St. Mary Axe, London E.C. 3.

Chartered Shipbrokers, Institute of: President, J. Malcolm: Chairman, F. W. Temperley; Secretary, J. A. Findlay: Address, 24, St. Mary Axe, London, E C. 3.

Clyde Sailing Shipowners' Association, Ltd.: Chairman, Colonel George Milne, C.B.; Secretaries, Walter Patterson, M.B.E., J.P., and Wm. Brash: Address, 94, Hope Street, Glasgow.

Clyde Sailing Ship Small Damage Association, Ltd. : Chairman, James Hardie; Secretaries, Walter Patterson, M.B.E., J.P., and Wm. Brash : Address, 94, Hope Street, Glasgow.

Clyde Steamship Owners' Association : President, D. T. C. Sloan ; Secretaries, Walter Patterson, M.B.E., J.P., and Wm. Brash : Address, 94, Hope Street, Glasgow.

Consulting Marine Engineers and Ship Surveyors, The Society of : President, George Humphreys ; Vice-Presidents, Joseph S. Blockett and George F. Mason ; Secretary, R. K. Munro ; Telephone, Avenue 2713 : Address, 32, Fenchurch Street, London, E.C. 3.

Empire Steamship Assurance Association, The : Managers, A. Bilbrough & Co., Ltd. : Address, 23, Rood Lane, London, E.C. 3.

Employers' Association of the Port of Liverpool : Address, Dock Board Building, Pier Head, Liverpool.

Engineering and Shipbuilding Trades, Federation of : President, A. A. H. Findlay ; Vice-President, A. Wilkie, M.P. ; Treasurer, W. Lorimer ; Secretary, F. Smith ; Telephone, Museum 3078 : Address, 15–16, Sicilian House, Southampton Row, London, W.C. 1.

General Register and Record Office of Shipping and Seamen ; Registrar-General, J. Blake Harrold, O.B.E., R.N.R. ; Assistant Registrar-General, C. L. Compton, M.B.E., R.N.R. ; Senior Staff Officer, T. Crone ; Telephones, Central 74, 75, 76, 77 ; Telegrams, "Registrar, Seaman (Ald.), London" : Address, Tower Hill, London, E. 1.

Glasgow Salvage Association : Committee, J. Patrick Cuthbert (Chairman), D. C. Dawson (Deputy Chairman), R. G. Service, William McInnes, and T. R. Clark ; Wreck Agent, Captain William Burns ; Secretary and Treasurer, William Stewart ; Telephone, Central 9520 ; Telegrams, "Underwriters. Gasgow" : Address, Underwriters' Rooms, Royal Exchange Buildings, Glasgow.

Glasgow Shipowners' Association : Chairman, W. S. Workman ; Deputy Chairman, W. Betts Donaldson ; Secretary, Jas. A. Mackenzie ; Telephone, Central 6608, Glasgow ; Telegrams, "Maritime, Glasgow" : Address, 150, St. Vincent Street, Glasgow.

Gravesend Sea School : Chairman, Captain H. Douglas King, C.B.E., D.S.O., M.P. : School Captain, Captain O. H. Lewis ; Hon. Secretary, Miss D. A. Wigner : Address, 28, St. Mary Axe, London, E.C. 3.

Hartlepools Shipowners' Society : Chairman, Lt.-Col. J. H. Ropner, J.P., D.L. ; Secretary, William Allen : Address, 4, Victoria Terrace, West Hartlepool.

Hull Incorporated Chamber of Commerce and Shipping : Chairman, Oswald Sanderson ; Secretary, A. Whitehead : Address, Chamber of Commerce, Hull.

Imperial Merchant Service Guild : Chairman, Captain J. G. Mutter ; Vice-Chairman, Captain W. Baker ; Secretary, Lieut. T. W. Moore, C.B.E., R.N.R. ; Assistant Secretary, G. B. Say, M.B.E. ; Treasurer, C. K. Mitchell ; Telephones, Bank 8971–2 ; Telegrams, "Dolphin, Liverpool" : Head Office, The Arcade, Lord Street, Liverpool.

Incorporated Soldiers' and Sailors' Help Society : President, The Duke of Connaught, K.G. ; Chairman of Executive Committee, Major-General Lord Cheylesmore, K.C.M.G., K.C.V.O. ; Vice-Chairman, Sir Henry Greer ; Secretary, Major-General Sir Bertram Boyce, K.C.M.G., C.B., D.S.O. ; Telephone, Kensington No. 1 ; Telegrams, "Peaceful, Knights, London" : Address, 122, Brompton Road, London, S.W. 3.

International Shipping Federation, Ltd. : Chairman, Sir F. Shadforth Watts ; General Manager, Cuthbert Laws ; Secretary, Michael Brett : Chief Office, 24, St. Mary Axe, London, E.C. 3.

Lancashire and National Sea Training Homes for Boys : President, The Rt. Hon. the Earl of Derby, K.G. ; Chairman, Sir Alfred Read ; Superintendent, Captain D. Agnew, N.R. ; Secretary, Miss Manning ; Telephone, Central 3887 : Address, Tower Building, Liverpool.

Leith Shipowners' Society : Chairman, Dr. James Currie ; Hon. Secretary, James Low : Address, 7, John's Place, Leith.

Liverpool and London Steamship Protection Association, Ltd. : Chairman, J. Bruce Ismay ; Vice-Chairman, Thomas Rome ; Manager and Secretary, Vivian D. Heyne ; Assistant Manager, Wm. Goffey ; Adviser to the Committee, Sir Norman Hill, Bt. ; Telephone, Central 1446 (3 lines) ; Telegrams, "Grayhill, Liverpool" : Address, 10, Water Street, Liverpool.

Liverpool and London War Risks Insurance Association, Ltd. : Chairman, J. Bruce Ismay ; Vice-Chairman, Sir Alfred A. Booth, Bt. ; Manager and Secretary, Vivian D. Heyne ; Assistant Manager, William Goffey ; Adviser to the Committee, Sir Norman Hill, Bt. ; Telephone, Central 1446 (3 lines) ; Telegrams, "Warisks, Liverpool" : Address, 10, Water Street, Liverpool.

Liverpool Master Stevedores' and Master Porters', Association of: Chairman, Henry E. Wright; Vice-Chairman, John E. Jones; Hon. Treasurer, W. G. Sutcliffe Rhodes; Hon. Secretary, W. H. Boase: Address, Tower Buildings, Liverpool.

Liverpool Navy League: President, The Rt. Hon. the Earl of Derby, K.G.; Chairman, Sir Alfred Read; Hon. Secretary, Miss Manning; Telephone, Central 3887: Address, Tower Building, Liverpool.

Liverpool Shipowners' Association: Chairman, Alex. Bicket, Junr.; Secretaries, Weightman, Pedder & Co.; Telegrams, "Weightman, Liverpool": Address, Barclay's Bank Building, Water Street, Liverpool.

Liverpool Shipping and Forwarding Agents' Association (Inc.): President, Arthur Cook; Council, James Jude (Chairman), E. H. Eckes (Vice-Chairman), F. J. Adams, R. A. Barker, D. G. Evans, W. Esplen, J. H. Hughes, J. Mitchell-Jones, W. R. Lloyd, D. Maccabe, W. S. Johnson; Hon. Secretary, S. L. Jude; Telephone, Bank 8705; Telegrams, "Impartial, Liverpool": Address, 20, Redcross Street, Liverpool.

Liverpool Steam Ship Owners' Association: Chairman, Richard D. Holt; Vice-Chairman, A. B. Cauty; Secretary, F. Russell Roberts; Telephones, Central 1446 (3 lines); Telegrams, "Grayhill, Liverpool": Address, 10, Water Street, Liverpool.

Liverpool Underwriters' Association, Inc.: Chairman, Samuel Barker; Deputy-Chairman, G. H. Court; Secretary, C. H. Penn: Address, Exchange Buildings, Liverpool.

Lloyd's: Chairman, Arthur L. Sturge; Deputy Chairman, Ernest E. Adams; Telephone, Central 680; Telegrams, "Lloyds, London": Address, Royal Exchange, London, E.C. 3.

Lloyds' Register of Shipping: Chairman, J. Herbert Scrutton; Chief Ship Surveyor, Sir Westcott S. Abell, K.B.E., M.Eng., M.Inst.C.E.; Chief Engineer Surveyor, H. Ruck-Keene, M.Inst.C.E.; Secretary, Andrew Scott; Telephones, City 8160–62; Telegrams, "Committee, Fen, London": Address, 71, Fenchurch Street, London, E.C. 3.

London General Shipowners' Society: Chairman, Robert Corry; Secretary, Douglas T. Garrett; Telephone, Avenue 7084: Address, 1, Fenchurch Avenue, London, E.C. 3.

London Steamship Owners' Mutual Insurance Association, Ltd.: Managers, A. Bilbrough & Co., Ltd.: Address, 23, Rood Lane, London, E.C. 3.

London Underwriters, Institute of; Vice-Chairman and Secretary, E. P. Hudson: Address, 1, St. Michael's House, Cornhill, London, E.C. 3.

Manchester Marine Insurance Association: Chairman, John Speers; Vice-Chairman, J. Brockbank; Secretary, Geo. Lombers; Telephone, Central 1228: Address, Parr's Bank Buildings, 3, York Street, Manchester.

Manchester Steamship Owners' Association: Chairman, W. F. Merchant; Vice-Chairman, A. E. Bowen; Treasurer, H. Pyke; Hon. Secretary, T Whyman; Telephone, City 2060, Manchester; Telegrams, "Membership, Manchester": Address, 3, Cathedral Street, Manchester.

Marine Engineers' Association, Ltd.: President, G. Gilroy; General Secretary, D. Bramah, C.B.E.; Telephone, Hop 1053; Telegrams, "Oarless Boroh, London": Head Office, London Bridge House, London Bridge, London, S.E. 1.

Marine Society: President, The Rt. Hon. the Earl of Romney; Chairman, Captain Sir Arthur Clarke, K.B.E.; Treasurer, J. F. W. Deacon; Captain Superintendent, Commander B. O. F. Phibbs, R.N. (retd.); Secretary, Captain C. G. A. Lenny, R.N. (retd.); Telephone, Avenue 7740; Telegrams, "Hanway, Stock, London": Address, Clark's Place, Bishopsgate, London, E.C. 2.

Mercantile Marine Service Association, Inc.: President, Captain G. C. M. Oakley; Vice-President, Captain H. Elliott; Deputy Vice-President, Captain H. G. Harrison; Hon. Treasurer, Gershom Stewart, M.P.; Secretary, Thos. Scott; Telephone, Central 690; Telegrams, "Topmast, Liverpool": Address, Tower Building, Water Street, Liverpool.

Mutual Marine Underwriting Association Ltd.: Chairman, H. J. Garthwaite; Managers, Walter Patterson, M.B.E., J.P., and William Brash: Address 94, Hope Street, Glasgow.

Missions to Seamen: President, Admiral The Hon. Sir E. R. Fremantle, G.C.B.; Secretary, Stuart C. Knox, M.A.: Address, 11, Buckingham Street, Strand, London, W.C. 2.

National Maritime Board. *See* British Mercantile Marine.

National Sailmaking Employers' Association: President, Wm. M. Rose; Vice-President, A. E. Nickles; Hon. Treasurer, Victor Wilson; Secretary, David M'Gill, Jr.: Telephone, Central 4535; Telegrams, "Sands, Glasgow": Address, 78, St. Vincent Street, Glasgow.

National Sailors' and Firemen's Union of Great Britain and Ireland: President, J. Havelock Wilson, C.H., C.B.E.; Treasurer, T. Chambers, C.B.E., J.P.; Secretary, E. Cathery, C.B.E.; Telephone, Hop 4006; Telegrams, "Searoving, Lamb, London": Head Office, St. George's Hall, Westminster Bridge Road, London, S.E. 1.

Nautical Almanac Office, H.M.: Superintendent, P. H. Cowell, M.A., F.R.S.; Chief Assistant, B. F. Bawtree: Address, Royal Naval College, Greenwich; London, S.E. 10.

Nautical College, Pangbourne, Berkshire: Captain Superintendent, Commander A. F. G. Tracy, R.N. (retd.); Managers, Devitt and Moore's Ocean Training Ships, Ltd., 84, Leadenhall Street, London, E.C. 3.

Navy, Army and Air Force Institutes: President, Admiral Sir W. de Salis, K.B.E.; Vice-President, Lieut.-General Sir G. F. Ellison, K.C.B., K.C.M.G.; Chairman Board of Management, Colonel Murrough J. Wilson, M.P.; Deputy-Chairman, G. McKechnie; General Manager, F. Benson, C.B.E.; General Secretary, Major R. Wilberforce, O.B.E.; Naval Secretary, Paymaster Lieut.-Commander F. J. S. Anderson: Address, Imperial Court, Upper Kennington Lane, London, S.E. 11.

Navy League: President, The Duke of Sutherland; Chairman, Sir Cyril S. Cobb, K.B.E., M.P.; Vice-Chairman, Gerard Fiennes, C.B.E.; Editor of *The Navy*, Guy Eden; Acting General Secretary, Lieut.-Com. J. N. Benbow, R.N. (retd.): Address, 13, Victoria Street, London, S.W. 1.

Newcastle Protection and Indemnity Association: Chairman, Sir William J. Noble, Bt.; Manager, Jas. Ferguson: Address, 4, Queen Street, Newcastle-on-Tyne.

Newcastle War Risks Indemnity Association, Ltd.: Chairman, J. Walter Burnett; Manager, Jas. Ferguson: Address, 4, Queen Street, Newcastle-on-Tyne.

Newport Shipowners' Association: Chairman, Fred. Jones; Secretary, J. A. Evans: Address, 86, Dock Street, Newport, Mon.

North of England Protecting and Indemnity Association: Chairman, Jas. Emery Tully; Vice-Chairman, John Denholm; Managers, J. Stanley Todd and Frederick Miller; Assistant Manager, S. M. Todd; Telephones, Central 5221-2-3; Telegrams, "Norprindem, Newcastle": Head Office, Collingwood Buildings, Newcastle-on-Tyne.

North of England Steamship Owners' Association: Chairman, R. J. Thompson, J.P.; Vice-Chairman, W. A. Souter; Hon. Treasurer, J. T. Lunn; Secretary, William T. Todd; Telephone, Central 1270; Telegrams, "Nemesis, Newcastle-on-Tyne": Address, 6, Sandhill, Newcastle-on-Tyne.

Officers' Association: Presidents, Earl Beatty, Earl Haig and Air-Marshal Sir H. M. Trenchard: Address, 48, Grosvenor Square, London, W. 1.

Register and Record Office of Shipping and Seamen. *See* General Register and Record Office of Shipping and Seamen.

Registry of Business Names: Registrar, H. Birtles; Assistant Registrar, A. E. Campbell-Taylor, O.B.E.: Address, 3 and 4, Clement's Inn, Strand, London, W.C. 2.

Royal Corps of Naval Constructors: Director of Naval Construction, Sir Eustace H. Tennyson d'Eyncourt, K.C.B., F.R.S., D.Sc.; Director of Warship Production, W. J. Berry, C.B.; Deputy Director of Dockyards, E. A. J. Pearce, O.B.E. (Temporary): Address, Department of Naval Construction, The Admiralty, Whitehall, London, S.W. 1.

Royal Merchant Seamen's Orphanage: Chairman, Sir Thos. L. Devitt, Bt.; Treasurer, The Rt. Hon. Lord Inchcape of Strathnaver, G.C.M.G., G.C.I.E., K.C.S.I.; Secretary, F. W. Rawlinson, C.B.E.: Address, Dixon House, Lloyd's Avenue, London, E.C. 4.

Royal Naval Benevolent Society: President, Admiral of the Fleet Lord Walter T. Kerr, G.C.B.; Secretary, Paymaster Captain Edward H. Shearme, C.B.E., R.N.: Address, 18, Adam Street, Adelphi, London, W.C. 2.

Royal National Lifeboat Institution: President, H.R.H. The Prince of Wales, K.G.; Chairman, Sir Godfrey Baring, Bt.; Deputy Chairman, The Hon. George Colville; Secretary, G. F. Shee, M.A.; Telephone, Gerrard 2161; Telegrams, "Lifeboat Institution, London": Address, 22, Charing Cross Road, London, W.C. 2.

Royal United Service Institution: President, Field Marshal H.R.H. The Duke of Connaught, K.G.; Chairman of the Council, Admiral Sir R. G. O. Tupper, G.B.E., K.C.B., C.V.O.; Vice-Chairman, Field-Marshal Sir W. R. Robertson, Bart., G.C.B., G.C.M.G., K.C.V.O., D.S.O.; Secretary, Lieut.-Colonel Sir A. Leetham, C.M.G., F.S.A.: Address, Whitehall, London, S.W. 1.

Salvage Association, Inc.: Chairman, P. G. Mackinnon; Deputy Chairman, F. Templeman; Secretary, Sir Joseph Lowrey, K.B.E.; Assistant Secretaries, F.C. Sadler and A. Muir Smith; Telegrams, "Wreckage, London": Address, 19, Birchin Lane, London, E.C. 3.

Scottish Shipmasters' and Officers' Association: Now amalgamated with the Mercantile Marine Service Association, *q.v.*

Seamen's Hospital Society: President, Commander H.R.H. The Duke of York, K.G., G.C.V.O., R.N.; Treasurer, Colonel Sir R. Williams, Bt., M.P.; Secretary, Sir James Michelli, C.M.G.; Telephone, Greenwich 370: Address, Seamen's Hospital, Greenwich, London, S.E. 10.

Seamen's National Insurance Society: Chairman of Management Committee, Sir Norman Hill, Bt.; Treasurer, Accountant-General to the Board of Trade; Secretary, Sidney H. Godfrey: Address, 19, Leman Street, London, E. 1.

Shipbuilding Employers' Federation: Secretary, Sir Chas. J. O. Sanders, K.B.E.; Assistant Secretary, A. Belch: Address, 9, Victoria Street, Westminster, London, S.W. 1.

Ship Constructors' and Shipwrights' Association: General Secretary, Alex. Wilkie, M.P., C.H.; Telephone, Central 1886; Telegrams, "Wilkie, Newcastle"; Registered Offices, 8, Eldon Square, Newcastle-on-Tyne.

Shipping Federation, Ltd.: President, Sir Thomas L. Devitt Bt.; Chairman of Executive Council, Sir Shadforth Watts; Vice-Chairman Executive Council, F. C. Allen; General Manager, Cuthbert Laws; Secretary, Michael Brett; Telephones, London Wall 9878 and 9879; Telegrams, "Traffic, Phone, London": Chief Office, 24, St. Mary Axe, London, E.C. 3.

Shipowners' Parliamentary Committee: Chairman, Hon. Alex. Shaw, M.P.; Vice-Chairman, Sir Thomas Royden, Bt., C.H.; Secretary, H. M. Cleminson: Address, 28, St. Mary Axe, London, E.C. 3.

Soldiers', Sailors' and Airmen's Families' Association: Chairman, Lieut-General The Hon. Sir Frederick W. Stopford, K.C.B., K.C.M.G., K.C.V.O.; Vice-Chairman, The Countess of March, C.B.E.; Hon. Treasurer, Major-General C.R.R. McGrigor, C.B., C.M.G.; Secretary and Organiser, Captain Sir George E. Wickham Legg, K.Ba.E., M.V.O.; Telephone, Victoria 396; Telegrams, "Gildea, Parl., London": Head Office, 23, Queen Anne's Gate, Westminster, London, S.W. 1.

Standard Ship Owners' Mutual Freight Dead Weight, Demurrage and Defence Association, Ltd.: Chairman, Sir Frederick Lewis, Bart.; Managers, Charles Taylor and Co.; Telephone, Avenue 4021; Telegrams, "Adno, Fen, London": Address, 9, Fenchurch Avenue, London, E.C. 3.

Standard Steamship Owners' Mutual War Risks Association, Ltd.: Chairman, Sir Frederick Lewis, Bart.; Managers, Charles Taylor and Co.; Telephone, Avenue 4021; Telegrams, "Adno, Fen, London": Address, 9, Fenchurch Avenue, London, E.C. 3.

Standard Steam Ship Owners' Protection and Indemnity Association, Ltd.: Chairman, Sir Frederick Lewis, Bart.; Managers, Charles Taylor & Co.; Telephone, Avenue 4021; Telegrams, "Adno, Fen, London": Address, 9, Fenchurch Avenue, London, E.C. 3.

Suez, Compagnie Universelle du Canal Maritime de: President, C. Jonnart; Chairman of London Committee and Vice-President, Lord Inchcape, G.C.M.G., K.C.S.I., K.C.I.E.; Secretary, George E. Bonnet: Address, 3, Whittington Avenue, Leadenhall Street, London, E.C. 3.

Sunderland Shipowners' Society: President, Lord Durham; Chairman, Ernest F. Dix; Secretary, J. G. Rutherford: Address, 45, West Sunniside, Sunderland.

Swansea Chamber of Commerce and Shipping: Chairman, Trevor Bowen; Vice-Chairman, Ivor A. Ambrose; Secretary, Henry J. Marshall; Assistant Secretary, C. Leakey; Telephone, Central 18; Telegrams, "Commerce, Swansea": Address, Chamber of Commerce, Swansea.

Thames Nautical Training College: Chairman, The Rt. Hon. Lord Inchcape of Strathnaver, G.C.M.G., K.C.S.I., K.C.I.E.; Captain Superintendent, Captain M. B. Sayer, C.B.E., R.N.R.; Head Master, T. R. Beatty, M.A.; Secretary, F. H. Stafford: Address, 72, Mark Lane, London, E.C. 3.

Trinity House, Honourable Corporation of: Master, Field-Marshal The Duke of Connaught, K.G.; Deputy-Master, Captain Sir H. Acton Blake, K.C.M.G., K.C.V.O.; Secretary, M. K. Smith, O.B.E.: Address, Tower Hill, London, E.C. 3.

Underwriters and Insurance Brokers in Glasgow, Association of: Committee, John M. Lamont (Chairman), Robert Law, Hugh M. Parker, Charles G. Fulton, Richard Gibson, Wm. Calderwood, George Jackson, and William McInnes; Secretary and Treasurer, William Stewart: Address, Underwriters' Rooms, Royal Exchange Buildings, Glasgow.

United Kingdom Mutual Steamship Assurance Association, Ltd.: Chairman, Sir Walter Runciman, Bt.; Managers, T. R. Miller & Son; Telephone, Avenue 2552; Telegrams, "Mutuality, Stock, London": Address, 24, St. Mary Axe, London, E.C. 3.

West of England Steamship Owners' Protection and Indemnity Association, Ltd: Chairman, Sir Shadforth Watts; Vice-Chairman, Sir John B. Wimble; Managers, John Holman & Sons: Address, 1, Lloyd's Avenue, London, E.C. 3.

COLONIAL AND FOREIGN SHIPPING ASSOCIATIONS.

AUSTRALIA.

Australasian Steamship Owners' Federation: Address, Steamship Buildings, 509, Collins Street, Melbourne.

Australian Masters' and Officers' Guild: Address, Sydney.

United Service Institution of Australia: Address, Sydney, N.S.W.

BELGIUM.

Antwerp Chamber of Commerce: Address, Local de la Bourse, Antwerp.

Antwerp Ship Repairers' Federation: Address, General Buildings, 14, Place de Meir, Antwerp.

Fédération Maritime: Address, Courte rue des Claires, 2, Antwerp.

International Shipping Federation, Ltd. (Belgian Branch): General Secretary, J. F. Drory: Address, 7, Quai Van Dyck, Antwerp.

Union des Armateurs Belges: President, Léon Dens; Secretary, Emile Deckers: Address, Longue Rue Neuve, 132, Antwerp.

CANADA.

American Association of Port Authorities: Address, Montreal.

Shipping Federation of Canada: President, R. W. Reford; Manager and Secretary, Thomas Robb: Address, 218, Board of Trade Building, Montreal.

CHINA.

China Coastwise Association: Address, Hong Kong.

DENMARK.

Assuranceforeningen Skuld. (Danish Branch): Address, Amaliegade 29A, Copenhagen.

Baltic and White Sea Conference: President, Theodore E. Salvesen; Secretary, J. F. Myre: Address, 7, Toldbodvei, Copenhagen.

Dansk Dampskibsrederiforening: President, Chr. Sass; Secretary, E. Maegaard: Address, Amaliegade 29A, Copenhagen.

International Shipping Federation, Ltd. (Danish Branch): General Secretary, A. O. Andersen: Address, Amaliegade 29A, Copenhagen.

FRANCE.

Bureau des Longitudes (Publishers of the French Nautical Almanac): Address Palais de l'Institut, 3, Rue Mazarine, Paris.

Comité Central des Armateurs de France: Chairman, Denis Pérouse; General Secretary, Paul de Rousiers: Address, 73, Boulevard Haussmann, Paris (8e).

French Nautical Almanac. *See* Bureau des Longitudes.

GERMANY.

Bremer Reederverein: Address, Haus Schütting, Bremen.

International Shipping Federation, Ltd., The, (German Branch): General Secretary, Dr. Paul Ehlers: Address, Adolphsbrücke 9, Hamburg.

Reederverein für den Bezirk der Handelskammer zu Flensburg: Address, Flensburg.

Reedereiverein zu Lübeck: Address, Breitestrasse 6, Lübeck.

Rostocker Reederverein: Address, Rostock.

Schutzverein Deutscher Reeder: Address, Hamburg.

Verein Hamburger Reeder: Address, Mönckebergstrasse 27 II, Hamburg.

Verein Stettiner Reeder: Address, Börse, Stettin.

Wirtschaftsausschuss der Deutschen Reederei: President, Dr. h. c. Sh. Heineken; Managing-President Staatsminister a. D. Graf. von Rhoedern: Address, Adolphsbrücke 9 (III), Hamburg.

Zentralverein Deutscher Reeder: President, Marius Böger: Managing-President, Staatsminister a. D. Graf. von Rhoedern: Address, Adolphsbrücke 9 (III), Hamburg.

HOLLAND.

Bond van Werkgevers in de Koopvaardy (Union of Employers in the Merchant Marine): Address, Rotterdam.
Centrale van Koopvardy-officierin (Central Union of Merchant Marine Officers): Address, Rotterdam.
International Shipping Federation, Ltd. (Dutch Branch): Secretary, J. Stakenburg: Address, Parklaan, 8, Rotterdam.
Nederlandsche Reedersvereeniging: President, Dr. H. J. Knottenbelt; Secretary, J. C. P. Krayenhoff van de Leur; Assistant Secretary, Dr. F. W. A. de Kock van Leeuwen: Address, Stationsweg 135, The Hague.
Scheepvaart Vereeniging "Nord" ("North" Shipping Association): Address, Amsterdam.
Scheepvaart Vereeniging "Zuid" ("South" Shipping Association): Address, Rotterdam.

INDIA.

United Service Institution of India: Address, Simla.

ITALY.

Federazione Armatori Italiani: Address, Via Cairoli 6, Genoa.
Federazione degli Armatori Liberi Italiani: President, Emanuele V. Parodi; Secretary, Carlo Raimondo: Address, Salita S. Caterina 4, Genoa.

JAPAN.

Japanese Merchant Marine Officers' and Engineers' Association: Address, No. 180, 8 Chome, Shimoyamate—Dori, Kobe.

NORWAY.

Assuranceforeningen Skuld.: President, Otto Thoresen; Managing Directors, Sir Anton Poulsson, K.B.E., and Einar Poulsson; Address, Carl Johansgate 1, Postbox 129, Christiania.
Det Norske Veritas: Address, Konensgt, 2, Christiania.
Nordisk Skibsrederforening: President, Otto Thoresen; General Manager, J. Jantzen: Address, Drammensveien, 21, Christiania.
Norges Rederforbund: President, Gustav Henriksen; Secretary, W. Klaveness: Address, Stortingsgt, 16, Christiania.
Skibsbyggerienes Landsforening: Address, Schestedsgt, 3, Christiania.

SPAIN.

"Almanaque Nautico" (The Spanish Nautical Almanac). *See* Observatorio de Marina.
Asociación de Navieros de Bilbao: President, Sir Ramón de la Sota, K.B.E.; Secretary, Antonio Arroyo: Address, Bilbao.
Observatorio de Marina (Publishers of the Spanish "Almanaque Nautico"); Director, Señor Leon Herrero: Address, San Fernando, Cadiz.

SWEDEN.

International Shipping Federation, Ltd. (Swedish Branch): General Secretary, O. A. Nordborg: Address, Sveriges Redareforening, Kungsportsavenyen, 1, Gothenburg.
Svenska Teknologföreningen adv. för Skeppsbyggnadskonst (Association of Swedish Engineers and Architects—Section for Naval Architecture): Address, Stockholm, 16.
Sveriges Allmänna Sjöfartsförening (Swedish General Shipping Association): Address, Hantverkaregatan 32, Stockholm.
Sveriges Angfartygs Assurans Förening: Address, Gothenburg.
Sveriges Redareforening (Swedish Shipowners' Association): President, Dan Broström; Secretary, O. A. Nordborg: Address, Kungsportsavenyen, 1, Gothenburg.
Sveriges Segelfartygsforening: Address, Ombudsmannen, Raa pr. Raus.

UNITED STATES.

American Association of Port Authorities: President, M. P. Fennell; Secretary, Tiley S. McChesney: Address, Room 200, New Orleans Court Building, New Orleans, Louisiana.

American Marine Association: President, Colonel E. A. Simmons; Secretary, K. Warren Heinrich: Address, 15, Park Row, New York, N.Y.

American Steamship Owners' Association: President, Alfred Gilbert Smith; Vice-President and General Manager, Winthrop L. Marvin: Address, 11, Broadway, New York.

American Steamship Owners' Mutual Protection and Indemnity Association: Address, 49 and 51, Wall Street, New York, N.Y.

Maritime Association of the Boston Chamber of Commerce; Chairman, Edward E. Blodgett; Manager, Frank S. Davis: Address, 177, Milk Street, Boston 9, Mass.

National Association of Engine and Boat Manufacturers: Secretary, R. R. Hand: Address: 29, West 39th Street, New York.

National Merchant Marine Association: President, Hon. Joseph E. Ransdell: Secretary, Mr. Henry C. Wiltbank: Address, Munsey Building, Washington, D.C.

Nautical Almanac: Director of the Almanac, Captain Eichelberger (Math), U.S.N.: Address, United States Naval Observatory, Washington, D.C.

Pacific American Steamship Association: President, Captain Robert Dollar; Secretary-Treasurer, J. P. Williams: Address, 336, Battery Street, San Francisco, California.

Port of New York Authority: Secretary: Wm. Leary: Address: 11, Broadway, New York.

Shipowners' Association of the Pacific Coast: President, R. W. Myers: Secretary-Treasurer, W. F. Sullivan: Address, 336, Battery Street, San Francisco, California.

BRITISH AND FOREIGN SHIPOWNERS.

(For particulars of the Steamship Services of the lines and firms given in this list see "The Steamship Services of the World" on page 664.)

Aberdeen Line, 7, Billiter Square, London, E.C. 3.
Aberdeen, Newcastle and Hull Steam Co., Ltd., 79, Regent Quay, Aberdeen.
Aberdeen Steam Navigation Co., Ltd., 87, Waterloo Quay, Aberdeen.
Adelaide Steamship Co., Ltd., Steamship Buildings, Currie St., Adelaide, South Australia; Yuills, Ltd., 120, Fenchurch St., London, E.C. 3.
Admiral Line, Rust Building, Tacoma, Wash., and L.C. Smith Building, Seattle, Wash., U.S.A.
African Steamship Co., 23, Billiter St., London, E.C. 3.
Alaska Steamship Co., Pier 2, Seattle, Wash., U.S.A.
Albany Steam Navigation Co., Ltd., 125, Bute Street, Cardiff.
Albyn Line, Ltd., York Chambers, Sunderland.
Alder, Ltd., Geo., Court Chambers, Albert Road, Middlesbrough.
Alexander Bros., Newcastle-on-Tyne.
Alexander and Mair, 81, Mitchell Street, Glasgow.
Alexandra Towing Co., Ltd., 25, Drury Buildings, 21, Water Street, Liverpool.
Allan Line, 25, Bothwell St., Glasgow.
Amalgamated Industrials, Ltd., Head Office, Alexandra House, 9, Union Court, Old Broad St., London, E.C. 2. Associated Companies: G. Heyn and Sons, Ltd., *q.v.*, and the Cork Steamship Co., Ltd., *q.v.*
American-Hawaiian Steamship Co.: Managers, United American Lines, *q.v.*
American Line: Branch of White Star Line, *q.v.*
American Petroleum Co., Ltd., 22, Willemsekade, Rotterdam, Holland.
Anchor-Brocklebank and Well Lines: Owners, T. and J. Brocklebank, Ltd., *q.v.*
Anchor-Donaldson, Ltd., 14, St. Vincent Place, Glasgow.
Anchor-Donaldson Line: Owners, Anchor-Donaldson, Ltd., *q.v.*
Anchor Line: Owners, Anchor Line (Henderson Brothers), Ltd., *q.v.*
Anchor Line (Henderson Brothers), Ltd.: Head Office, Anchor Line Buildings, St. Vincent Place, Glasgow; London Office, 16, Gracechurch St., E.C. 3.
Anderson, Green and Co., Ltd., Head Office, 5, Fenchurch Avenue, London, E.C. 3.
Andreson, Chr., Amaliegade, 29A, Copenhagen, K., Denmark.
Anglo-American Oil Co., Ltd., 36, Queen Anne's Gate, Westminster, London, S.W. 1
Anglo-Celtic Shipping Co., Ltd., 3, Pier Head Chambers, Bute Street, Cardiff.
Anglo-Egyptian Oilfields, Ltd., St. Helen's Court, Leadenhall Street, London, E.C. 3.
Anglo-Grecian Steam Trading Co., Ltd., 18–20, Creechurch Lane, London, E.C.3.
Anglo-Saxon Petroleum Co., Ltd., Head Office, St. Helen's Court, Leadenhall St., London, E.C. 3.
Anning Brothers, Merchants' Exchange, Cardiff.
Antrim Iron Ore Company, Ltd., 1, Victoria Chambers, Victoria Street, Belfast.
Arab Steamers, Ltd., 40, Church Gate Street, Fort, Bombay.
Argentine Navigation Co. (Nicholas Mihanovitch), Ltd., 36, Lime Street, London, E.C. 3.
"Argo" Dampfschiffahrtsgesellschaft, Langenstrasse, 104–106, Bremen, Germany.
"Artus" Danziger Reederei und Handels A.-G., Kohlenmarkt 9, Danzig.
Asiatic Steam Navigation Co., Ltd, The: Managers, Turner and Co., *q.v.*
Aster Shipping Co., Ltd., 120, Merchants' Exchange, Cardiff.
Astigarraga, Hijos de; Bertendona No. 4, Bilbao, Spain.
Atkinson and Prickett, E. E., Kingston Chambers, Land of Green Ginger, Hull.
Atkinson and Sons, E. P., 3, St. John Street, Goole.
Atlantic Fruit Company, Inc., 17, Battery Place, New York, U.S.A.
Atlantic, Gulf & West Indies Steamship Lines, 25, Broadway, New York, U.S.A.
Atlantic Line: Branch of White Star Line, *q.v.*
Atlantic Refinery Co., 3144, Passyunk Avenue, Philadelphia, Pa., U.S.A.

Atlantic Transport Co., of West Virginia, 1, Broadway, New York, U.S.A.
Atlantic Transport Line, 9, Broadway, New York, U.S.A., and 38, Leadenhall St., London. E.C. 3.
Australasian United Steam Navigation Co., Ltd., 120, Leadenhall St., London, E.C. 3.
Australian Commonwealth Line of Steamers: Head Office in England, Australia House, Strand, London, W.C. 2; Head Office in Australia, 447–451, Collins St., Melbourne.
Australian Steamships Pty., Ltd., 35-45, Market St., Melbourne, and 38, Cornhill, London, E.C. 3.
Backke and Co., Trondhjem, Norway.
Bain, Sons and Co., Portreath, Redruth, Cornwall.
Balls and Son, W. D. C., 60, Tyne Street, North Shields.
Baltimore and Carolina Steamship Co., 1010, American Building, Baltimore, U.S.A.
Baltische Reederei, 36, Admiralitätstrasse, Boltenhof, Hamburg, Germany.
Bannister, A., Fish Dock Road, Grimsby.
Barber and Co., Inc., Whitehall Building, 17, Battery Place, New York, U.S.A.
Barber Steamship Lines, Ltd., 19, James Street, Liverpool.
Bay Steamers, Ltd., 468, Collins Street, Melbourne, Victoria, Australia.
Bear Creek Oil and Shipping Co., Ltd.: Managers, C. Bowring & Co., Ltd., *q.v.*
Beattie, J., 47, Lowther Street, Whitehaven.
Becker and Co., Ltd., 34-40, Ludgate Hill, London, E.C. 4.
Becker, W. H., 401, Rockefeller Building, Cleveland, Ohio, U.S.A.
Beckingham and Co., Milburn House, Newcastle-on-Tyne.
Belfast and Mersey Steamship Co., Ltd., 2, Corporation Square, Belfast.
Belfast Steamship Co., Ltd.: Head Office, 42 & 43, Donegal Quay, Belfast; Liverpool Office, Royal Liver Building; London Office, 29, Cockspur St., S.W. 1.
Belgian Government (Administration de la Marine), 90, Rue de la Loi, Brussels, Belgium.
Bell & Co., James, Bell Chambers, Paragon St., Hull.
Bell Brothers and Co., 135, Buchanan Street, Glasgow.
Belle Steamers, Ltd., 7, Swan Lane, Upper Thames Street, London, E.C. 4.
Ben Line Steamers, Ltd.: Managing Owners, William Thompson & Co., *q.v.*
Bennett Line: Owners, Bennett Steam Ship Co., Ltd., *q.v.*
Bennett Steam Ship Co., Ltd., Bank Chambers, Goole.
Bergen Lloyd, Bergen, Norway.
Bergenske Dampskibsselskab, Det, Head Office, Post Box 215, Bergen, Norway.
Bergesen, Sigval, Stavanger, Norway.
Bergh and Helland, Post Box 25, Bergen, Norway.
Best and Co., T. G., 332, Royal Liver Building, Liverpool.
Bibby Line, 26, Chapel St., Liverpool, and 135, Font St., New York, U.S.A.
Birkenhead Corporation Ferries, Woodside Ferry, Birkenhead.
Black and Co., Ltd., John: Joint Managers with Donaldson Bros., Ltd., of Donaldson South American Line, *q.v.*
Bland Line (Managing Owners, M. H. Bland and Co., Ltd.), Cloister Building, Gibraltar; London agents, Watts, Watts and Co., Ltd., 7, Whittington Avenue, Leadenhall St., E.C. 3.
Blue Funnel Line: Managers, Alfred Holt & Co., *q.v.*
Blue Star Line, Ltd., Holland House, Bury St., London, E.C. 3.
Bolten, Aug., Wm. Miller's Nachfolger, 36, Admialtätstrasse, Boltenhof, Hamburg, Germany.
Bolton and Co., F., 57, Bishopsgate, London, E.C. 2.
Bombay and Persia Steam Navigation Co., Ltd., 40, Churchgate Street, Fort, Bombay.
Bombay Steam Navigation Co., Ltd., 120, Frere Road, Bombay.
Booth Line, Cunard Building, Liverpool, and 11, Adelphi Terrace, London, W.C. 2.
Bowring & Co., Ltd., C. T.: Head Office, 20, Castle St., Liverpool; London Office, 52, Leadenhall Street, E.C. 3.
Bowring Steamship Co., Ltd.: Managers, C. T. Bowring & Co., Ltd., *q.v.*
Bristol Channel Steamers, Ltd., 68-69, The Exchange, Cardiff.
Bristol City Line of Steamers, Ltd., Albion Dockyard, Bristol.
Bristol Steam Navigation Co., Ltd., 50, Prince Street, Bristol.
British Africa Shipping and Coaling Co., Ltd., Cape House, Cape Town.
British and African Steam Navigation Co., Ltd., Colonial House, Water St., Liverpool.
British and Argentine Steam Navigation Co., Ltd. (Associated Company of the Furness-Houlder Argentine Lines, Ltd.): 53, Leadenhall Street, London, E.C. 3.
British and Irish Steam Packet Co., Ltd., Head Office, 27, Sir John Rogerson's Quay, Dublin; London Office, 1, Seething Lane, E.C. 3.
British India Line: Owners, British India Steam Navigation Co., Ltd., *q.v.*

British India Steam Navigation Co., Ltd., Head Office, 122, Leadenhall St., London, E.C. 3; Agents in India: Mackinnon, Mackenzie & Co., Chief Office, Calcutta.
British Rhineland Navigation and Transport Co., Ltd.: Managers, Burton, Smart and Orford, Ltd., *q.v.*
British Tanker Co., Ltd., Britannic House, 23, Great Winchester Street, London, E.C. 2.
Brocklebank, Ltd., T. & J. (Anchor-Brocklebank & Well Lines), Cunard Building, Liverpool.
Broström, Dan, 5, Packhusplatsen, Gothenberg, Sweden.
Brown Shipping Co. (Newcastle), Ltd., The: Managers, Robinson, Brown and Co., *q.v.*
Brunsgaard, Kiosteruds Damps., Drammen, Norway.
Bugge, N., Tonsberg, Norway.
Bull & Co., A. H., 17, Battery Place, New York, U.S.A.
Burns and Laird Lines, Ltd., 52, Robertson Street, Glasgow.
Burns Ltd., G. & J., Head Office, 30, Jamaica St., Glasgow.
Burns, Philp and Co., Ltd., 7, Bridge Street, Sydney, N.S.W.
Burns Steamship Co., Ltd., The: Managers, G. and J. Burns, Ltd., *q.v.*
Burton, Smart and Orford, Ltd., Head Office, 10 and 11, Lime St., London, E.C. 3.
Cairn Line of Steamships, Ltd. *See* Cairns, Noble & Co., Ltd.
Cairns, Noble & Co., Ltd., Head Office, Akenside House, Side, Newcastle-on-Tyne; London Office, 32, Great St. Helens, E.C. 3.
Camillo Tank Steamship Co., Ltd., The: Managers, C. T. Bowring and Co., Ltd., *q.v.*
Canada Steamship Lines, Ltd., 9–11, Victoria Square, Montreal.
Canadian Government Merchant Marine Ltd.: Head Office, 230, St. James St., Montreal; London Office, 17–19, Cockspur St., S.W. 1; New Zealand Office, Ferry Building, Quay St., Auckland.
Canadian Pacific Steamships, Ltd., Head Office, 8, Waterloo Place, Pall Mall, London, S.W. 1.
Canadian Pacific Railway Co.'s Ocean Steamship Line. *See* Canadian Pacific Steamships, Ltd.
Carlsson, G., Gothenberg, Sweden. *See* also Transatlantic S.S. Co., Ltd.
Carron Line, 125, Buchanan Street, Glasgow.
Cayzer, Irvine & Co., Ltd.: Head Office, 2, St. Mary Axe, London, E.C. 3.
Chambers & Co., James, 3 & 5, King St., Liverpool.
Chapman and Son, R., Maritime Buildings, Newcastle-on-Tyne.
Chargeurs Réunis, Cie. Française de Navigation à Vapeur, 1, Boulevard Malesherbes, Paris.
Charlton and Co., Ltd., Royal Dock, Grimsby.
Chellew Steam Navigation Co., Ltd., R. B., 47, Stuart Street, Cardiff.
Cheong Yue Steamship Co., Ltd., 5, Queen's Road Central, Hong Kong.
Chicago, Duluth and Georgian Bay Transit Co., 110, W. Adams Street, Chicago, Ill., U.S.A.
China-Australia Steamship Co., Ltd., China House, 249, George Street, Sydney, N.S.W.
China Mail Steamship Co., Ltd., 510, Montgomery Street, San Francisco, Cal., U.S.
China Mutual Steam Navigation, Co., Ltd. (known as the Blue Funnel Line): Managers, Alfred Holt and Co., *q.v.*
China Navigation Co., Ltd., 8, Billiter Square, London, E.C. 3.
"City" Line: Head Office, 75, Bothwell, St., Glasgow; Liverpool Office, 22, Water St.; London Agents, Montgomerie and Workman (1920), Ltd., 104–106, Leadenhall St., E.C. 3. Owners of "City" Line, Ellerman's Lines, Ltd., *q.v.*
Clan Line Steamers, Ltd., The: Managing Owners, Cayzer, Irvine & Co., *q.v.*
Clarke, Stephenson & C., Head Office, 4, St. Dunstan's Alley, London, E.C. 3.
Cleveland-Cliffs Iron Co., 11th Floor, Kirby Building, Cleveland, Ohio, U.S.A.
Clyde Shipping Co., Ltd., 21, Carlton Place, Glasgow, and 138, Leadenhall St., London, E.C. 3.
Clyde Steamship Co.: Head Office, Pier 36, North River, New York, U.S.A.
Coast Lines, Ltd.: Head Office, Royal Liver Building, Liverpool; London Office, 1, Seething Lane, E.C. 3
Commonwealth & Dominion Line, Ltd., 9 & 11, Fenchurch Avenue, London, E.C. 3.
Compagnie Générale Transatlantique, 6, Rue Auber, Paris, and 4, Lloyd's Avenue, London, E.C. 3.
Compagnie Havraise Péninsulaire de Navigation à Vapeur; Head Office, 10, Rue de Châteaudun, Paris; London Agents, Thomas and Son, 26, Billiter St., E.C. 3.
Companhia Commercio e Navegação, 37, Avenida Rio Branco (Caixa 482), Rio de Janeiro, Brazil.

Companhia Nacional de Navegação Costeira, 303, 331, Avenida Rodrigues Alves, Rio de Janeiro, Brazil.
Compañia Transatlantica, Cadiz, Spain.
Compañia Trasmediterránea, Head Office, Pasaje del Comercio 1 & 3, Barcelona, Spain; London Office, 20, Copthall Avenue, E.C.
Cork Steamship Co., Ltd., Alexandra House, 9, Union Court, Old Broad St., London, E.C. 2.
Cornborough Shipping Line, Ltd., The: Managing Owners, Sir William Reardon Smith and Sons., Ltd., *q.v.*
Cory Colliers, Ltd., Cory Buildings, Fenchurch Street, London, E.C. 3.
Cory & Sons, Ltd., John, Mount Stuart House, Cardiff: London Agents, Ockenden & Son, 4, St. Mary Axe, E.C. 3.
Cunard Line: Owners, Cunard Steam Ship Co., Ltd., *q.v.*
Cunard Steam Ship Co., Ltd.: Head Office, Cunard Building, Pier Head, Liverpool; London Office, 51, Bishopsgate, E.C. 2.
Currie Line: Owners, The Leith, Hull and Hamburg Steam Packet Co., Ltd.; Managers, James Currie & Co., *q.v.*
Currie & Co., James: Head Office, 16, Bernard St., Leith.
Dalgliesh, Ltd., R. S.: Head Office, Watergate Buildings, Sandhill, Newcastle-on-Tyne; London Office, 22, Billiter St., E.C. 3.
Dalgliesh Steam Shipping Co., Ltd.: Managers, R. S. Dalgliesh, Ltd., *q.v.*
Dampskibsactieselskabet Otto Thoresens Linie, Prinsengade 1, Christiania.
Denmark State Railways (De Danske Statsbaner), Trommesalen, 5, Copenhagen, B., Denmark.
Det forenede Dampskibs-Selskab Aktieselskab: Head Office, Kvœsthusgade 7 and 9B, Copenhagen, K., Denmark; London Agents, The United Shipping Co., Ltd., 108, Fenchurch St., E.C. 3.
Devon Shipping Co., Ltd.: Managing Owners, Harrison, Sons and Co., Ltd., *q.v.*
Dominion Line: purchased by Frederick Leyland and Co., Ltd., *q.v.*
Donaldson Bros., Ltd., Joint Managers with John Black and Co., Ltd., of Donaldson South American Line, Ltd., *q.v.*
"Donaldson" Line, Ltd.: Head Office, 14, St. Vincent Place, Glasgow; London Office, 16, Gracechurch St., E.C. 3.
Donaldson South American Line, Ltd.: Head Office, 14, St. Vincent Place, Glasgow; London Office, 16, Gracechurch St., E.C. 3.
Eagle Oil Transport Co., Ltd., 16, Finsbury Circus, London, E.C. 2.
East Asiatic Co., Ltd. (United Baltic Corp., Ltd., 158, Fenchurch St., London, E.C. 3), 2, Holbergsgade, Copenhagen, Denmark.
Elder, Dempster & Co., Ltd., Colonial House, Water St., Liverpool, and 4, St. Mary Axe, London, E.C. 3.
Elders and Fyffes, Ltd., 31 and 32, Bow St., Covent Garden, London, W.C. 2.
Ellerman & Bucknall Steamship Co., Ltd., 104–106, Leadenhall St., London, E.C. 3.
Ellerman's "City" and "Hall" Lines. *See* City Line; and Hall Line.
Ellerman Lines, Ltd.: Head Office, 22, Water St., Liverpool; London Office, 104–106, Leadenhall St., E.C. 3.
Ellerman's Wilson Line, Ltd., Hull: London Agents, The United Shipping Co., Ltd., 108, Fenchurch St., E.C. 3.
Federal Steam Navigation Co., Ltd., 2, Fenchurch Avenue, London, E.C. 3.
Finland Line, Helsingfors, Finland: Chas. Gee & Co., 17, Gracechurch St., London, E.C. 3.
Fisher, Alimonda & Co., Ltd., 110, Fenchurch St., London, E.C. 3.
France, Fenwick & Co., Ltd., Wm., 5, Fenchurch St., London, E.C. 3.
Furness-Houlder Argentine Lines, Ltd.: Head Office, 22, Billiter St., London, E.C. 3; Liverpool Office, 201, Royal Liver Building.
Furness Line: Owners, Furness, Withy and Co., Ltd., *q.v.*
Furness-Prince Line: Owners, Furness, Withy and Co., Ltd., *q.v.*
Furness, Withy & Co., Ltd., Furness House, Leadenhall St., London, E.C. 3.
General Steam Navigation Co., Ltd.: Head Office, 15, Trinity Square, London, E.C. 3.
Gilwen Shipping Co., Ltd.: Managing Owners, Harrison, Sons and Co., Ltd., *q.v.*
Glasgow and Highland Royal Mail Steamers: Owners, David MacBrayne, Ltd., *q.v.*
Glasgow United Shipping Co., Ltd.: Managing Owners, Maclay and McIntyre, *q.v.*
Glen Line, Ltd.: Head Office, 1, East India Avenue, London, E.C. 3.
Gould Steamship and Industrials, Ltd.: Head Office, Merthyr House, Cardiff; London Agents, J. C. Gould, Angier and Co., Ltd., Ethelburga House, Bishopsgate, E.C. 2.
Gow, Harrison & Co., 8, Gordon St., Glasgow.
Grace & Co., W. R.: Head Office, 1, Hanover Square, New York, U.S.A.; Associated Company and Agents, Grace Brothers, Ltd., 144, Leadenhall Street, London, E.C. 3.

Green Star Steamship Corporation, 24, State Street, New York, U.S.A.
Hain Steamship Co., Ltd., St. Ives, Cornwall; London Agents, Foster, Hain and Read, Ltd., 24 St Mary Axe, E.C. 3.
Hall Bros. Steamship Co., Ltd., Royal Arcade, Newcastle-on-Tyne.
Hall Line, Ltd.: Head Office, Tower Building, Water St., Liverpool; London Office, Hall Line Agency, 104-106, Leadenhall Street, E.C. 3. (Owners, The Ellermann Lines, Ltd.)
Hamburg-Amerika Line. *See* Hamburg-Amerikanische Packetfahrt A.-G.
Hamburg-Amerikanische Packetfahrt Aktien-Gesellschaft, Alsterdamm 25, and Ferdinandstrasse 58/62, Hamburg, Germany.
Hansen, C. K., Amaliegade 29B, Copenhagen, Denmark.
Harrison Line: Owners, Thos. and Jas. Harrison, *q.v.*
Harrison, Thos. and Jas.: Head Office, Mersey Chambers, Old Churchyard, Liverpool; London Office, Dock House, Billiter Street, E.C. 3.
Harrison, Sons & Co., Ltd.: Head Office, Dowlais Chambers, Cardiff; London Agents, H. G. Harper and Co., 14, St. Mary Axe, E.C. 3.
"Head" Line & "Lord" Line: Managing Owners, G. Heyn and Sons, Ltd., *q.v.*
Henderson and Co., P. (P.O. Box, 72), 153, St. Vincent Street, Glasgow; London Agents, Galbraith, Pembroke and Co., 34, Leadenhall Street, E.C. 3.
Henderson Line: Owners, Henderson & Co., P., *q.v.*
Heyn and Sons, Ltd., G.: Head Office, Head Line Buildings, Victoria St., Belfast; Associated Company, Amalgamated Industrials, Ltd., Alexandra House, 9, Union Court, Old Broad Street, London, E.C. 2.
Hogarth & Sons, H., 24, St. Enoch Square, Glasgow.
Holland-Amerika Lijn (Nederlandsch-Amerikaansche Stoomvaat-Maatschappij): Head Office, Rotterdam, Holland; London Agents, The International Navigation Co., Ltd., 1 Cockspur Street, S.W. 1. (Passenger); and Phs. van Ommeren (London) Ltd., 27, Leadenhall Street, E.C. 3 (Freight).
Holt & Co., Alfred: Head Office, India Buildings, Water St., Liverpool; London Agents, John Swire and Sons, 8 Billiter Square, E.C. 3; and Geo. Wills and Sons, Ltd. (for Australian Passenger Steamers only).
Houlder Brothers & Co., Ltd.: Head Office, 53, Leadenhall St., London, E.C. 3.
Houston Lines: Owners, R. P. Houston & Co., *q.v.*
Houston and Co., R. P.: Head Office, 10, Dale Street, Liverpool; London Office, 16, Leadenhall Street, E.C. 3.
Huddart, Parker, Ltd., 466, Collins St., Melbourne, and 101, Leadenhall St., London, E.C. 3.
Hull Steam Navigation Co., Ltd.: Managers, R. S. Dalgliesh, Ltd., *q.v.*
Indo-China Steam Navigation Co., Ltd., Hong Kong and 3, Lombard St., London, E.C. 3.
Instone & Co., Ltd., S., Baltic House, Docks, Cardiff, and 53, Leadenhall St., London, E.C. 3.
International Navigation Co., Ltd.: Branch of White Star Line, *q.v.*
"Janeta" Steamship Co., Ltd.: Owners, Maclay and McIntyre, *q.v.*
Java-China-Japan Lijn: Head Office, Prins Hendrikkade 34, Amsterdam, Holland; London Agents, Keller, Bryant and Co., 115-117, Cannon Street, E.C. 4.
Johnson, Axel Axelson, Stockholm, Sweden.
Johnson Line: Owners, Furness, Withy and Co., Ltd., *q.v.*
Johnston Line, Ltd.: Head Office, Royal Liver Building, Liverpool; London Office, 6, Billiter St., E.C.3.
Kawasaki Dockyard Co., Ltd., Kobe, Japan.
Kerr Steamship Co., Inc.: Head Office, New York; London Associated Company, R. S. Dalgliesh, Ltd., *q.v.*
Koninklijke Hollandsche Lloyd: Head Office, Oostelyke Handelskade, Amsterdam, Holland; London Agents, Wainwright Bros. and Co, 21, Fenchurch Street, E.C.3 (General); and D. H. Drakeford, 60, Haymarket, S.W. 1 (Passenger Agent).
Koninklijke Nederlandsche Stoomboot Maatschappij (Royal Netherlands Steamship Co.), Scheepvaarthuis, Prins Hendrikkade 108-114, Amsterdam, Holland.
Koninklijke Paketvaart Maatschappij (Royal Packet Navigation Co.), 112-114, Prins Hendrikkade, Amsterdam, Holland; London Agents, Keller, Bryant & Co., 115-117, Cannon Street, E.C. 3.
Koninklijke West-Indische Maildienst (Royal Netherlands West India Mail): Head Office, Prins Hendrikkade, 108-114, Amsterdam, Holland; London Agents, Phs. van Ommeren (London) Ltd., 27, Leadenhall, Street, E.C. 3.
Laird Line, Ltd.: Head Office, 52, Robertson Street, Glasgow; London Office, 29, Cockspur Street, S.W. 1.
Lamport & Holt, Ltd., Royal Liver Building, Pier Head, Liverpool.
Lang & Fulton, Ltd.: Head Office, 1, Cathcart Street, Greenock; London Agents, James Foulton and Co., 3 and 4, Lime Street Square, E.C. 3.

Larrinaga & Co., Ltd.: Head Office, 30, James St., Liverpool; London Agents, Wainwright Bros. and Co., 21 Fenchurch Street, London, E.C. 3.

Leeds Shipping Co., Ltd.: Managing Owners, Sir W. R. Smith and Sons, Ltd., *q.v.*

Leith, Hull & Hamburg Steam Packet Co., Ltd., The: Managers, James Currie and Co., *q.v.*

Leyland Line: Owners, Frederick Leyland and Co., Ltd., *q.v.*

Leyland and Co., Ltd., Frederick: Head Office, 27 and 29, James Street, Liverpool; London Offices, 38, Leadenhall Street, E.C.; and 1, Cockspur Street, S.W. 1.

"Livingstonia" Steamship Co., Ltd.: Managing Owners, Maclay and McIntyre, *q.v.*

Lloyd Brazileiro, Cia. de Nav., Praça Servulo Dourado, Rio de Janeiro, Brazil.

Lloyd Royal Belge (Great Britain), Ltd., 101, Leadenhall St., London, E.C. 3.

Lloyd Sabaudo, Società Anonima per Azioni: Head Office, 5, Via Stottoripa, Genoa, Italy.

Lloyd Triestino, Società di Navigazione a Vapore: Head Office, Trieste, Italy; London Agents, Italian State Railways, Waterloo Place, Regent Street, S.W. 1 (Passengers); and Fisher, Alimarda and Co., Ltd., 110, Fenchurch Street, E.C. 3 (Freight).

"Lord" Line ("Head" Line and "Lord" Line): Managing Owners, G. Heyn and Sons, Ltd., *q.v.* *See also* "Head" Line.

MacAndrews & Co., Ltd.: Head Office, "Goree," Water Street, Liverpool; London Office, Suffolk House, Laurence Pountney Hill, E.C. 4.

MacBrayne, Ltd., David, 119, Hope St., Glasgow.

McIlwraith, McEacharn's Line (Proprietary), Ltd., Scottish House, 94-96, William St., Melbourne, Victoria, and Billiter Square Buildings, London, E.C. 3.

Maclay & McIntyre, 21, Bothwell St., Glasgow.

"Magdala" Steamship Co., Ltd: Managing Owners, Maclay and McIntyre, *q.v.*

Mallory Steamship Co.: Head Office, Pier 36, North River, New York, U.S.A.

Manchester Liners, Ltd., Manchester Liners House, St. Anne's Square, Manchester.

Messageries Maritimes, Cie. des: Head Office, 9, Rue de Sèze, Paris (9); London Office, 72-75, Fenchurch St., E.C. 3.

Mitsui Bussan Kaisha, Ltd. (Mitsui & Co., Ltd.), 1, Surugacho, Nihonbashi-Ku, Tokyo, Japan.

"Mombassa" Steamship Co., Ltd.: Managing Owners, Maclay and MacIntyre, *q.v.*

Moss & Co., H. E., 18, Chapel St., Liverpool, and 43, St. Mary Axe, London, E.C. 3.

Moss and Co., Ltd., James: Managers of Moss Steamship Co., Ltd., *q.v.*

Moss Steamship Co., Ltd.: Head Office, 31, James St., Liverpool; London Agents, Moxon, Salt and Co., Ltd., 101, Leadenhall Street, E.C. 3.

Navigazione Generale Italiana: Head Office, 6, Via Balbi, Genoa; London Agents, Italian State Railways, 12, Waterloo Place, Regent St., London, S.W. 1 (for Passengers); and Farina, Galliano, Brizzolesi and Co., 11, Bury Street, London, E.C. 3 (for Freights).

"Nederland" Stoomvaart Maatschappij. *See* Stoomvaart Maatschappij Nederland.

Nederlansch-Amerikaansche Stoomvaart-Maatschappij. *See* Holland-Amerika Lijn.

Nelson, Ltd., H. & W.: Head Office, 98, Leadenhall St., London, E.C. 3; Liverpool Office, 20, Water St.

Nelson Line (Liverpool) Ltd.: Owners, H. and W. Nelson, Ltd., *q.v.*

Nelson Steam Navigation Co., Ltd.: Owners, H. and W. Nelson, Ltd., *q.v.*

Neptune Line: Managers, Burton, Smart and Orford, Ltd., *q.v.*

New York & Cuba Mail Steamship Co. (Ward Line), Foot of Wall St., New York, U.S.A.

New York, Newfoundland and Halifax Steamship Co., Ltd.: Managers, C. T. Bowing and Co., Ltd., *q.v.*

New York & Porto Rico Steamship Co.: Head Office, 25, Broadway, New York, U.S.A.; London Agents, Harris and Dixon, Ltd., 81, Fenchurch St., E.C. 3.

New Zealand Shipping Co., Ltd., Maritime Buildings, Wellington, N.Z., and 138, Leadenhall St., London, E.C. 3.

Nippon Yusen Kabushiki Kaisha (Japan Mail Steamship Co., Ltd.), 1, Yurakucho Itchome, Kojimachi-Ku, Tokyo, Japan, and Coronation House, Lloyd's Avenue, London, E.C. 3.

Nisshin Kisen Kabushiki Kaisha (Japan-China Steamship Co., Ltd.), 1, Yurakucho, 1 chome, Kojimachi-Ku, Tokyo, Japan.

Norddeutscher Lloyd, Bremen, Germany.

Nordenfjeldske Dampskibs-Selskab, Det, Trondhjem, Norway, and 353, Strand, London, W.C. 2.

Norske Amerika Linie A/S., Den, Strandgaten 1, Christiania, Norway.

North Coast Steam Navigation Co., Ltd., 3, Sussex St. North, Sydney, N.S.W.

Northern Navigation Co., Ltd.: Managing Owners, Canada Steamship Lines, Ltd., *q.v.*

Oakwin Steamship Co., Ltd.: Managing Owners, Sir W. R. Smith and Sons, Ltd., *q.v.*

Ocean Steamship Co., Ltd.: Managers, Alfred Holt and Co., *q.v.*

Oceanic Steam Navigation Co., Ltd., Owners of White Star Line, *q.v.*

Oil Tank Steamship Co., Ltd.: Managers, C. T. Bowring and Co., Ltd., *q.v.*

Orient Line to Australia: Managers, Anderson, Green and Co., Ltd., *q.v.*

Osaka Shosen Kabushiki Kaisha, 64, Tomijimacho, Kitaku, Osaka, Japan.

Pacific Steam Navigation Co., Inc.: Head Office, Goree, Water St., Liverpool; London Office, 18, Moorgate St., E.C. 2.

Pacific Steamship Co., L. C. Smith Building, Seattle, U.S.A.

Pan American Petroleum & Transport Co.: Head Office, 1015, Security Building, Los Angeles, Cal., U.S.A.: New York Office, 120, Broadway.

Panama Railroad Co., 24, State St., New York, U.S.A.

Pelton Steamship Co., Ltd.: Head Office, Milburn House, Newcastle-on-Tyne; London Office, 39, Lombard St., E.C. 3.

Peninsular & Oriental Steam Navigation Co., Inc., 122, Leadenhall St., London, E.C. 3.

P. & O. Service to Australia *viâ* the Cape, 32, Lime St., London, E.C. 3.

Petersen & Co., Ltd., 6, Lloyd's Avenue, London, E.C. 3.

Petrograd Steamers, Ltd., Hull: London Agents, The United Shipping Co., Ltd., 108, Fenchurch St., E.C. 3.

Philadelphia Transatlantic Line: Owners, Furness, Withy & Co., Ltd., *q.v.*

Pinillos, Izquierdo & Co., Plaza San Augustin 2, Cadiz, Spain.

Pollock, Sons & Co., Ltd., Sir James, 3, Lloyd's Avenue, London, E.C. 3.

Pool Shipping Co., Ltd.: Managers, Sir A. Ropner & Co., Ltd., *q.v.*

Porto Rico Line: Managers, New York and Porto Rico Steamship Co., *q.v.*

Prince Line, Ltd., 56, Leadenhall St., London, E.C. 3.

Radcliffe & Co., Evan Thomas, Baltic House, Cardiff.

Raeburn & Vérel, Ltd., 45, West Nile Street, Glasgow.

Rederiaktiebolaget Transatlantic. *See* Transatlantic Steamship Co., Ltd.

Red Star Line (Société Anonyme de Navigation Belge-Américaine): Head Office, 22, Rue des Peignes, Antwerp; London Office, 1, Cockspur St., Westminster, S.W. 1.

Regis Shipping Co., Ltd.: Managing Owners, Harrison, Sons & Co., Ltd., *q.v.*

Ridley, Son & Tully, John, Milburn House, Newcastle-on-Tyne.

Rio Cape Line, Ltd. (Owners: Furness Withy, & Co. Ltd.), 56, Leadenhall St., London, E.C. 3.

Robert Stanley Shipping Co., Ltd.: Managers, R. S. Dalgliesh, Ltd., *q.v.*

Robertson, Wm., 45, West Nile St., Glasgow.

Robinson, Brown & Co.: Head Office, Custom House Chambers, Newcastle-on-Tyne.

Ropner & Co., Ltd., Sir R.: Head Office, Mercantile Chambers, Mainsforth Terrace, West Hartlepool; London Office, 22, St. Mary Axe, E.C. 3; Cardiff Office, Exchange Buildings, Mount Stuart Square.

Ropner Shipping Co., Ltd.: Managers, Sir R. Ropner & Co., Ltd., *q.v.*

Rotterdam-South America Line (Rotterdam-Zuid Amerika Lijn): Managers, Van Nievelt, Goudriaan & Co.'s Stoomvaart Maatschappij, *q.v.*

Royal Mail Steam Packet Co.: Head Office, Royal Mail House, Moorgate, London, E.C. 2.

Russian Volunteer Fleet, 18, Rue Moncey, Paris, France: The Borneo Co. Ltd., 28, Fenchurch St., London, E.C. 3.

Ruys & Zonen, Wm., Veerhaven, 7, Rotterdam, Holland.

St. Just Steamship Co., Ltd.: Managing Owners, Sir W. R. Smith & Sons, Ltd., *q.v.*

Salvesen & Co., Ch.: Head Office, 29, Bernard St., Leith.

Scadia Lines: Managers, Burton, Smart & Orford, Ltd., *q.v.*

Shaw, Savill & Albion Co., Ltd.: Head Office, 34, Leadenhall St., London, E.C. 3.

Sheaf Steam Shipping Co., Ltd.: Managing Owners, W. A. Souter & Co., Ltd., *q.v.*

Shire Line: Owners, Thos. Law & Co., 123, Hope Street, Glasgow.

Smart's Continental Lines: Managers, Burton, Smart and Orford, Ltd., *q.v.*

Smith & Sons, Ltd., Sir William Reardon: Head Office, Merthyr House, James St., Cardiff; London Office, Billiter Buildings, Billiter Street, E.C. 3.

Società di Navigazione "Sicilia": Head Office, Via del Giardino 76, Rome, Italy.

Società Italiana di Servizi Marittimi, Piazza Venezia 11, Rome, Italy.

Société Anonyme de Navigation Belge Américaine. *See* Red Star Line.

Société Générale d'Armement, 1, Place Graslin, Nantes, France.

Société Générale de Transports Maritimes à Vapeur: Head Office, 5 Rue de Surène, Paris (8e), France; London Agents, H. E. Moss & Co., 43, St. Mary Axe, E.C. 3.

Société "Les Affréteurs Réunis": Head Office, 15 Rue Scribe, Paris, France; London Office, Sussex House, 88A, Leadenhall St., E.C. 3.

Société Navale de l'Ouest: Head Office, 8, Rue Auber, Paris (9e); London Agents, Langstaff, Ehrenberg and Pollak, Leadenhall Buildings, E.C. 3; and The Anglo-Guinea Produce Co., Ltd., 33–35, Eastcheap, E.C. 3.

Sota and Aznar: Head Office, Bilbao, Spain; London Office, 1, Lloyd's Avenue, E.C. 3.

Souter & Co., Ltd., W. A.: Head Office, Akenside House, Akenside Hill, Newcastle-on-Tyne.

Southern Pacific Co., Atlantic Steamship Lines, 165, Broadway, New York, U.S.A.

Stern, J. (Société des Affréteurs Réunis), 15, Rue Scribe, Paris.

Stockholms Rederiaktiebolag Svea., Skeppsbron 30, Stockholm, Sweden.

Stoomvaart Maatschappij "Nederland": Head Office, 108–114, Prins Hendrikkade, Amsterdam, Holland; London Agents, Keller, Bryant & Co., 115-117, Cannon St., E.C. 4 (General); and D. H. Drakeford, 60, Haymarket, S.W. 1 (Passenger).

Straits Steamship Co., Ltd., St. Helen's Court, Collyer Quay, Singapore.

Strick & Co., Ltd., Frank C., Baltic House, Leadenhall St., London, E.C. 3.

Sun Shipping Co., Ltd.: Head Office, 3, St. Helen's Place, London, E.C. 2.

"T" Steam Coasters, Ltd.: Managers, Robinson, Brown & Co., *q.v.*

Tatsuuma Kisen Kabushiki Kaisha (Tatsuuma Steamship Co.), Nishinomiya, near Kobe, Japan.

Thomson & Co., William: Head Office, 28, Bernard St., Leith; London Agents, Killick, Martin & Co., 7, Fen Court, Fenchurch St., E.C. 3; and Galbraith, Pembroke & Co., 34, Leadenhall St., E.C. 3.

Town Line (London), Ltd.: Managing Owners, Harrison, Sons & Co., Ltd., *q.v.*

Town Line Shipping Co., Ltd.: Managing Owners, Harrison, Sons & Co., Ltd., *q.v.*

Toyo Kisen Kabushiki Kaisha (Oriental Steamship Co., Ltd.), No. 1, 1-chome Eirakucho, Kojimachi-Ku, Tokyo, Japan.

Transatlantic Steamship Co., Ltd.: Head Office, Gothenburg, Sweden; London Agents, J. E. Hyde, 1, Lime St. Square, E.C. 3.

"Transocéanic" Societa Italiana di Navigazione, Naples, Italy.

Transport Co., Ltd., 8-11, Lime St., London, E.C. 3.

Turner, Brightman & Co., 8 & 9, Great St. Helens, London, E.C. 3.

Turner & Co.: Head Office, 45, St. Mary Axe, London, E.C. 3.

Ulster Steamship Co., Ltd.: Managing Owners, G. Heyn & Sons, Ltd., *q.v.*

Unér Aktiebolag, H., Norrköping, Sweden.

Union-Castle Line (Owners, The Union-Castle Mail Steamship Co., Ltd.): Head Office, 3, Fenchurch St., London, E.C. 3.

Union Steam Ship Co. of New Zealand, Ltd., Wellington, N.Z., and 138, Leadenhall St., London, E.C. 3.

United American Lines (Inc.): Head Office, 39, Broadway, New York, U.S.A.; London Agents, E. H. Mundy & Co., Port of London Building, Seething Lane, E.C.

United States Steel Products Co.: Head Office, 30, Church St., New York, U.S.A.; London Agents, Isthmian Steamship Co., Ltd., 138, Leadenhall St., E.C. 3.

United States Transport Co., Inc., 50, Broad St., New York, U.S.A.

Van Nievelt, Goudriaan & Co.'s, Stoomvaart Maatschappij, N.V.: Veerhaven, 2, Rotterdam, Holland.

Van Ommeren, Phs.: Head Office, Westerlaan 10, Rotterdam, Holland; London Office, Baltic House, 27, Leadenhall St., E.C. 3.

Virginia Line: Furness, Withy & Co., Ltd., *q.v.*

Walford Lines, Ltd.: Owners, Walford (London) Ltd., Leopold, *q.v.*

Walford (London) Ltd., Leopold: 29, Great St. Helens, London, E.C. 3.

Watergate Steam Shipping Co., Ltd.: Managers, R. S. Dalgliesh, Ltd., *q.v.*

Watts, Watts & Co., Ltd., 7, Whittington Avenue, Leadenhall St., London, E.C. 3.

Weir & Co, Andrew, Baltic Exchange Buildings, 19, 20, 21, Bury St., London, E.C. 3.

Westall, James, 13, John St., Sunderland.

White Star-Dominion Line: Branch of White Star Line, *q.v.*

White Star Line: Head Office, 30, James St., Liverpool; London Office, 1, Cockspur St., S.W. 1.

Wilhelmsen, Wilh., Christiania, Norway.

Wilson's and London and North-Eastern Railway Shipping Co., Ltd., Hull: London Agents, The United Shipping Co., Ltd., 108, Fenchurch St., E.C. 3.

Wilson Transit Co., 948, Kirby Building, Cleveland, Ohio, U S A.

Witherington & Everett, Exchange Buildings, Quayside, Newcastle-on-Tyne.

Ybarra & Co., Calle San Jose 5, Seville, Spain.

BRITISH SHIPBUILDERS, MARINE ENGINEERS AND REPAIRERS.

(S) Shipbuilders.
(M) Marine Engineers.
(D) Dry Dock Owners and Ship Repairers.

Abdela and Mitchell, Ltd., Isaac J. (S) (M): *Registered Offices*, 55, George Street, Manchester; *Works*, Brinscombe, Stroud, Glos., and Queensferry, Chester.

Aberdeen Harbour Commissioners (D): *Offices*, 16, Regent Quay, Aberdeen.

Aberdeen Trawl Owners' and Traders' Association (M): *Offices*, Albert Quay, Aberdeen.

Abernethy and Co., Ltd. (M): *Offices and Works*, Ferryhill Foundry, Aberdeen.

Ailsa Shipbuilding Co., Ltd. (S) (M) (D): *Head Office*, Troon; *Works*, Troon and Ayr.

Aitchison, Blair, Ltd. (M): *Offices and Works*, Whitecrook Engine Works, Clydebank, N.B.

Aldous, Ltd. (S): *Offices and Works*, Brightlingsea.

Alison and Co., Ltd., J. Gordon (D): *Offices*, Dock Engine Works, Birkenhead.

Allen, Sons, and Co., Ltd., W. H. (M): *Head Office and Works*, Queen's Engineering Works, Bedford; *London Office*, 5, Victoria Street, Westminster, S.W.1.

Alley and MacLellan, Ltd. (S) (M): *Head Offices and Works*, Sentinel Works, Polmadie, Glasgow; *London Office*, 32, Victoria Street, S.W.1.

Amble Shipbuilding Co., Ltd. (S): *Head Office and Works*, Hebburn-on-Tyne; *London Office*, 116, Fenchurch Street, E.C.3.

Amos and Smith, Ltd. (M) (D): *Head Office and Works*, Albert Dock Works, Hull.

Ardrossan Dry Dock and Shipbuilding Co., Ltd. (S) (D): *Head Office and Works*, Shipyard, Ardrossan, N.B.

Armstrong, Whitworth and Co., Ltd., Sir W. G. (S) (M): *Registered Office and Works*, Elswick Works, Newcastle-on-Tyne; *London Offices*, 8, Great George Street, S.W.1, and 38–39, Parliament Street, S.W.1 (Shipyard Department).

Austin and Son, Ltd., S. P. (S) (D): *Head Offices and Works*, Wear Dockyard, Sunderland.

Ayrshire Dockyard Co., Ltd. (S) (D): *Head Office and Works*, Shipyard, Irvine, Ayrshire.

Babcock and Wilcox, Ltd. (M), Glasgow.

Baggesen and Co. (M) (D): *Offices and Works*, Craigie Engine Works, Dundee.

Bailey, C. H. (D): *Offices*, Cardiff; *Docks*, Newport, Mon., and Cardiff.

Baird Bros. Ltd. (M): *Offices*, Bull Ring, North Shields.

Barclay, Curle and Co., Ltd. (S) (M) (D): *Head Offices*, Whiteinch; *Shipbuilding Yards*, Clydeholm, Whiteinch; and West Shipyard, Scotstoun; *Engine Works*, 36, Finnieston Street, Glasgow; *Boiler Works*, 90, Kelvinhaugh Street, Glasgow.

Barry Graving Dock and Engineering Co., Ltd. (D): *Offices*, Barry Dock, near Cardiff.

Bartram and Sons, Ltd. (S): *Offices and Shipyard*, South Dock, Sunderland.

Beardmore, W., and Co., Ltd. (S) (M) (D): *Head Offices*, Parkhead Forge Rolling Mills and Steel Works, Glasgow; *Registered Office*, 36, Victoria Street, London, S.W.1; *Shipyard and Engine Works*, Dalmuir.

Beazley, H. J. (S) (D): *Offices and Works*, Clausentum Yard, Northam Bridge, Southampton.

Belfast Harbour Commissioners (D): *Offices*, Corporation Square, Belfast.

Bell, Ltd., Hemsley (M): *Registered Office*, 2–4, William Street, Southampton; *London Office*, 116, Fenchurch Street, E.C.3.

Bergius Launch and Engine Co. (M): *Offices and Works*, Glasgow.

Bickle Engineering Co., Ltd. (M) (D). *Offices*, G.W.R. Docks, Plymouth.

Blackett's Construction Co., Ltd. (S): *Offices*, Thornaby, Stockton.

Blair and Co., Ltd. (M): *Offices and Works*, Norton Road, Stockton-on-Tees.

Blumer, and Co., Ltd., John (S): *Offices and Works*, North Dock Shipyard, Sunderland.

Blyth Shipbuilding and Dry Dock Co., Ltd. (S) (M) (D): *Offices and Works*, Blyth, Northumberland.

Blythswood Shipbuilding Co., Ltd. (S): *Office and Works*, Blythswood Shipyard, South Street, Scotstoun, Glasgow.

Bow, McLachlan and Co., Ltd. (S) (M): *Head Office and Works*, Thistle Works, Paisley; *London Office*, 108, Fenchurch Street, London, E.C.3.

Braby and Co., Ltd., Frederick (S): *Offices*, Victoria Wharf, Grove Street, Deptford, London, S.E.8.

Brigham and Cowan (Hull) Ltd. (D): *Office*, Hedon Road, Hull.

Brigham and Cowan Ltd. (D): *Offices*, South Shields.

Bristol Corporation (D): *Head Office*, Queen's Square, Bristol.

British India Steam Navigation Co., Ltd. (D): *Head Offices*, 122, Leadenhall Street, London, E.C.3.

British Marine Motor and Launch Co, Ltd. (S) (M); *Head Offices*, Old Kirkpatrick, near Glasgow; *London Office*, 9, Billiter Square, E.C.3.

British Thomson-Houston Co. (M): *Head Offices and Works*, Rugby.

Brooke and Co., Ltd., J. W. (S) (M): *Offices*, Adrian Works, Lowestoft.

Brown and Co., George (S): *Offices and Works*, Garvel Shipyard, Greenock.

Brown and Co., John, Ltd. (S) (M): *Registered Offices*, Atlas Works, Savile Street, Sheffield; *Shipbuilding and Engineering Works*, Clydebank Shipyard, near Glasgow; *London Office*, 8, The Sanctuary, Westminster, S.W.1.

Brown's Shipbuilding and Dry Dock Co., Ltd. (S) (D): *Offices*, Lime Street, Hull.

Burntisland Shipbuilding Co., Ltd. (S): *Offices and Works*, Burntisland, Fife.

Burrell, William (M): *Offices and Works*, Victoria Works, Great Yarmouth.

Bute Shipbuilding, Engineering and Dry Dock Co., Ltd. (S) (D): *Offices*, Bute Dry Dock, Cardiff.

Caird and Co., Ltd. (S), Greenock. *See* Harland and Wolff, Greenock.

Caledon Shipbuilding and Engineering Co., Ltd. (S) (M): *Head Offices*, Lilybank Engine Works, Kemback Street, Dundee; *Shipyards*, Caledon Shipyard, and Stannergate Shipyard, Camperdown Street, Dundee; *London Office*, Billiter House, Billiter Street, E.C.3.

Cammell Laird and Co., Ltd. (S) (M) (D): *Registered Office and Steel Works*, Sheffield; *Shipyards*, Birkenhead; *Carriage and Wagon Works*, Nottingham; *London Office*, 3, Central Buildings, S.W.1.

Campbell and Calderwood, Ltd. (M): *Offices*, Murray Street, Paisley, N.B.

Campbeltown Shipbuilding Co., Ltd. (S): *Offices*, Campbeltown, N.B.

Camper and Nicholsons, Ltd. (S) (D): *Head Office*, Gosport; *Branch Office*, Southampton.

Cardiff Channel Dry Docks and Pontoon Co., Ltd. (D): *Offices*, Mount Stuart Square, Cardiff.

Carver and Son, Ltd., F. J. (D): *Offices*, Bridgwater.

Central Marine Engine Works (M): *Head Offices and Works*, West Hartlepool.

Chambers, Ltd., John (S) (M) (D): *Head Office*, Oulton Broad, Lowestoft.

Clark, Ltd., Geo. (M): *Offices and Works*, Southwick Engine Works, Sunderland.

Clelands (Ship Repairers) Ltd. (D): *Head Office and Works*, Willington Quay-on-Tyne.

Cleveland Shipbuilding Co., Ltd. (S) (D): *Head Offices*, Cleveland Dockyard, Middlesbrough-on-Tees: *London Offices*, 56, Victoria St., S.W.1.

Clover, Clayton and Co., Ltd. (D): *Managers*, H. and C. Grayson, Ltd.; *Head Offices*, Royal Liver Building, Liverpool; *Works*, Birkenhead.

Clyde Navigation, Trustees of the (D): *Offices*, 16, Robertson Street, Glasgow.

Clyde Shipbuilding and Engineering Co., Ltd. (S) (M) (D): *Head Offices*, Castle Works, Port Glasgow.

Coaster Construction Co., Ltd. (S): *Head Office*, 124, St. Vincent Street, Glasgow; *Shipyard*, Rossie Island, Montrose.

Cockrane and Sons, Ltd. (S): *Registered Office and Works*, Ouse Shipbuilding Yard, Selby, Yorks.

Connell, Chas. and Co, Ltd. (S): *Head Offices*, Scotstoun Shipbuilding Yard, Scotstoun, Glasgow.

Connell, Henry (D): *Offices and Shipyard*. Ousgate, Selby, Yorks.

Cook, Welton and Gemmell, Ltd. (S) (M): *Registered Office*, Grovehill, Beverley, Yorks.

Cooper and Greig, Ltd. (S): *Head Offices*, Britannia Works, East Dock Street, Dundee; *London Office*, 17, Victoria Street, S.W.1.

Cosens and Co., Ltd. (M) (D): *Head Office*, Custom House Quay, Weymouth.

Cox and Co. (Engineers), Ltd. (S) (M) (D): *Offices*. Falmouth.

Crabtree and Co., Ltd. (S) (M): *Offices and Works*, Southtown Works, Great Yarmouth.

Craig, Taylor and Co., Ltd. (S): *Head Offices*, Stockton-on-Tees.

Cramptons (Shipbuilders), Ltd. (S) (D): *Offices and Works*, Albion Shipyard, Mile End, Portsmouth.

Cran and Somerville, Ltd., John (S) (M) (D): *Head Offices*, Tower Street, Leith, Scotland; *Works*, Tower Street and Shore, Leith.

Crichton and Co., Ltd., J. (s) (m) (d): *London Offices*, Grand Trunk Building, 17–19, Cockspur Street, S.W.1; *Liverpool Offices*, Tower Buildings, Water Street; *Shipbuilding Yard*, Saltney Shipyard, Chester.
Crown and Sons, Ltd., John (s) (d): *Head Offices*, Strand Slipway, Sunderland.
Cumming, D. M. (s): *Offices and Works*, Glasgow.
Day, Summers and Co., Ltd. (s) (m) (d): *Head Offices*, Northam Iron Works, Southampton.
Denny and Brothers, Ltd., Wm. (s) (m): *London Offices*, 16, St. Helen's Place, E C.3; *Registered Offices*, Leven Shipyard, Dumbarton.
Deptford Dry Docks Co., Ltd. (d): *Offices*, Deptford, London, S.E.8.
Diamond and Co., Ltd., Thos. (d): *Offices and Works*, West Side, East Bute Docks, Cardiff.
Dibles, Ltd. (s) (d): *Offices and Works*, Belvidere Shipyard, Southampton.
Dickinson and Sons, Ltd., J. (m): *Head Offices and Works*, Palmers' Hill Engine Works, Sunderland.
Dixon and Co., Ltd., Sir R. (s) (d): Middlesbrough-on-Tees; now incorporated in the Cleveland Shipbuilding Co., Ltd., *q.v.*
Dixon Bros. and Hutchinson, Ltd. (m) *Offices and Works*, Woolston, Southampton.
Dobson and Co., W. (s): *Head Offices*, Low Walker, Newcastle-on-Tyne.
Doig (Grimsby), Ltd., S. G. (d): *Offices and Works*, Fish Dock, Grimsby.
Douglas and Grant, Ltd. (m): *Head Offices*, Dunnikier Foundry, Kirkcaldy; *London Office*, Hastings House, Norfolk Street, Strand, W.C.2.
Doxford and Sons, Ltd., Wm. (s) (m): *Head Offices*, Pallion Yard, Sunderland; *Registered Offices*, Basildon House, Moorgate Street, London, E.C.2.
Dublin Dockyard Co., Ltd. (s) (d): *Offices*, Alexandra Basin, North Wall, Dublin.
Dublin Port and Docks Board (d): *Head Offices*, 19, 20, 21, Westmoreland Street, Dublin.
Dublin Shipbuilders, Ltd. (s) (m) (d): *Registered Office*, 39, Nassau Street, Dublin; *Works Office*, Ringsend Dockyard, Dublin; *Works*, Alexandra Road Shipyard, Dublin, and Ringsend Dockyard, Dublin.
Duncan and Co., Ltd., Robt. (s): *Offices and Shipyard*, Brown Street, Port Glasgow.
Dundee Harbour Trust (d): *Head Offices*, Harbour Chambers, Dundee.
Dundee Shipbuilding Co., Ltd. (s) (d): *Offices and Shipyard*, Panmere Shipyard, Dundee.
Dunlop, Bremner and Co., Ltd. (s) (m): *Head Offices*, Inch Works, Port Glasgow.
Dunsmuir and Jackson, Ltd. (s): *Registered Offices*, Princes Street, Govan, Glasgow.
Dunston, Ltd., Richard (s): *Offices*, Thorne, near Doncaster.
Duthie, Torry Shipbuilding Co., John (s): *Offices*, Torry, Aberdeen.
Earle's Shipbuilding and Engineering Co., Ltd. (s) (m) (d): *Head Offices*, Hedon Road, Hull.
Edwards and Co., Ltd. (s): *Head Offices*, 240, West Ferry Road, Millwall, London, E.14.
Elliott and Garrood, Ltd. (m): *Head Offices and Works*, Ingate Iron Works, Beccles.
Elliot and Jeffery (d): *Offices and Works*, Bute Docks, Cardiff.
Eltringhams, Ltd. (s) (m) (d): *Head Offices*, Stone Quay Shipbuilding and Engineering Works, Willing Quay-on-Tyne; *London Office*, 4, London Wall Buildings, E.C.2; *Transfer Office*, 37/41, Gracechurch Street, London, E.C.3.
Erimus Dock Co., Ltd. (d): *Registered Offices*, Court Chambers, Albert Road, Middlesbrough.
Fairfield Shipbuilding and Engineering Co., Ltd. (s) (m): *Head Offices*, Fairfield Shipbuilding and Engineering Works, Govan, Glasgow; *Registered Office*, 9, Victoria Street, London, S.W.1; *City Office*, 77, Gracechurch Street, London, E.C.3.
Falmouth Docks and Engineering Co., Ltd. (d): *Offices and Works*, Falmouth.
Fellows and Co., Ltd. (s) (d): *Offices*, Southdown Dry Docks, Great Yarmouth.
Ferguson Bros. (Port Glasgow), Ltd. (s) (m): *Offices*, Port Glasgow.
Fleming and Ferguson, Ltd. (s) (m): *Head Offices*, Phœnix Works, Merksworth, Paisley; *London Offices*, 91, Victoria Street, S.W.1.
Fletcher, Son and Fearnall, Ltd. (d): *Offices*, Union Docks, Limehouse, London, E.14.
Flett, Carson and Co., Ltd. (d): *Offices*, 194, Finnieston Street, Glasgow.
Forbes, J. and G. (s) (d): *Offices*, Sandhaven, near Fraserburg, Scotland.
Forth Shipbuilding and Engineering Co. (1921), Ltd. (s) (m): *London Offices*, Vickers House, Broadway, Westminster, S.W.1; *Shipyards*, Forth Yard, Forthbank Yard, and Jeffrey Yard, Alloa, Scotland; *Boiler Works*, Moore Park, Govan, Glasgow.
Fraser and Chalmers Engineering Works (m): *Proprietors*, The General Electric Co., Ltd.; *London Offices*, Magnet House, Kingsway, W.C.2: *Works*, Erith, Kent.

Fullerton and Co., John (S): *Head Office*, Merksworth Building Yard, Paisley.
Furness Shipbuilding Co., Ltd. (S): *Offices*, Haverton Hill-on-Tees.
Gauldie, Gillespie and Co., Ltd. (M): *Offices*, Broomhall Engine Works, Kinning Park, Glasgow.
Goole, Aire and Calder Navigation (D): *Head Offices*, Leeds.
Goole Shipbuilding and Repairing Co., Ltd. (S) (D): *Head Offices*, Goole.
Grangemouth Dockyard Co., Ltd. (S) (D): *Offices and Works*, Canal Street, Grangemouth.
Gray and Co., Ltd., Wm. (S) (D): *Head Offices*, West Hartlepool.
Grayson, Ltd., H. and C. (S) (D): *Head Offices*, Royal Liver Building, Liverpool; *Works at* Liverpool, Garston, Birkenhead, and Holyhead.
Great Western Railway (D): *Head Office*, Paddington Station, London, W.2.
Green and Silley Weir, Ltd., R. and H. (D): *Registered Offices*, Cory Buildings, Fenchurch Street, London, E.C.3; *General Office*, Blackwall, London, E.14.
Greenock Dockyard Co., Ltd. (S) (D): *Head Offices and Shipyard*, Main Street, Greenock.
Greenock Harbour Trust (D): *Offices*, Greenock.
Greenwell and Co., Ltd., T. W. (D): *Registered Offices*, Graving Dock Repair Works, South Dock, Sunderland.
Grey and Co., Ltd., Geo. T. (M): *Offices and Works*, Holborn Engineering Works, South Shields.
Hall and Co., Ltd., Alexander (S) (M): *Offices and Works*, 40, York Street, Aberdeen.
Hall, Russell and Co., Ltd. (S) (M) (D): *Head Offices and Works*, Aberdeen Iron Works, York Place, Aberdeen.
Hansen Shipbuilding and Repairing Co., Ltd. (S) (D): *Offices*, Cleve Houses, Bideford.
Harkness and Son, Ltd., W. (S) (D): Middlesbrough-on-Tees. Now Incorporated in the Cleveland Shipbuilding Co., Ltd., *q.v.*
Harland and Wolff, Ltd. (S) (M) (D): *Offices, Shipyard and Engine Works*, Queen's Island, Belfast; *Engineering and Repairing Works at* Liverpool, London, and Southampton; *Shipyards at* Govan and Greenock, Scotland; *Engine Works at* Finnieston, Glasgow; Scotstoun, Glasgow; and Clyde Factory, Govan; *London Offices*, 1A, Cockspur Street, S.W.1.
Harris Bros., Ltd. (D); *Offices and Works*, Cambrian Dry Docks, Swansea.
Harvey Shipbuilding Co., Ltd. (S) (D): *Offices and Works*, Littlehampton.
Hawthorn, Leslie, and Co., Ltd., R. and W. (S) (M) (D): *Registered Offices and Works*, St. Peter's Works, Newcastle-on-Tyne; *London Offices*, 3A, Dean's Yard, Westminster, S.W.1, and Exchange Chambers, St. Mary Axe, E.C.3.
Hawthorns and Co., Ltd. (S) (M): *Registered Offices and Works*, Leith Engine Works, Leith; *Shipyard*, Victoria Shipyard, Leith; *London Office*, Grand Trunk Building, 17-19, Cockspur Street, S.W.1; *Liverpool Office*, 229, Tower Building.
Hayes, Ltd., Edward (S) (M): *Works and Offices*, Stony Stratford.
Henderson and Co., Ltd., D. and W. (S) (M) (D): *Head Offices and Shipyard* Meadowside Docks and Shipbuilding Yards, Partick, Glasgow; *Engine Works*, 190, Elliot Street, Glasgow.
Hepples (1919), Ltd. (S) (M) (D): *Offices and Works*, Wapping Street, South Shields.
Herd and MacKenzie (S) (D): *Offices*, Buckie and Findochty, Banff.
Hill and Sons, Ltd., Charles (S) (D): *Offices*, Albion Dockyard, Cumberland Road, Bristol.
Hills' Dry Docks, and Engineering Co., Ltd. (D): *Offices*, East Bute Dockard, Cardiff.
Holman and Sons, Ltd., N. (D): *Offices*, Penzance; *Works*, Penzance and St. Just, Cornwall.
Holmes and Co., Ltd., Charles D. (S): *Offices and Works*, Alfred Street, Hull.
Hull Central Dry Dock and Engineering Works, Ltd. (D): *Offices*, Humber Street, Hull.
Humber Graving Dock and Engineering Co., Ltd. (D): *Registered Offices and Works*, King's Dock, Immingham.
Hutsons, Ltd. (M): *Offices*, Kelvinhaugh Engine Works, Kelvinhaugh Street, Glasgow.
Inglis, Ltd., A. and J. (S) (M) (D): *Engine Works*, 64, Warroch Street, Glasgow; *Shipyard*, Pointhouse Shipyard, Glasgow.
Irvin and Sons, Ltd., Richard (S) (D): *Offices*, 8, Bridge Street, Peterhead.
Irvine's Shipbuilding and Dry Docks Co., Ltd. (S) (D); *Head Offices*, Middleton Shipyard, West Hartlepool; *Transfer Office*, 37/41, Gracechurch Street, London, E.C.3.
Jefferies and Sons, Ltd. J. (M) (D): *Offices*, 116, Fenchurch Street, London, E.C.3.
Kemp and Co., Ltd., R. (S) (D): *Offices*, The Shipyard, Hythe, Southampton.
Khedivial Mail Steamship and Graving Dock Co., Ltd. (D): *Registered Offices*, 122, Leadenhall Street, London, E.C.3.
Kincaid and Co., Ltd., J. G. (M): *Offices and Works*, East Hamilton Street; and Arthur Street, Greenock, Scotland.

King's Lynn Slipway Co., Ltd. (s) (d): *Offices*, West Lynn Shipyard, King's Lynn.

Laing and Sons, Ltd., Sir James (s) (d): *Head Offices*, Deptford Yard, Sunderland.

Leith Harbour and Dock Commissioners (d): *Offices*, Tower Place, Leith.

Lester and Perkins, Ltd. (d): *Head Offices and Works*, Royal Albert Dry Docks, London, E.16.

Lewis and Sons, Ltd., John (s) (m) (d): *Offices*, Albert Quay, Aberdeen.

Lithgows, Ltd. (s) (d): *Head Offices*, Kingston Shipbuilding Yard, Port Glasgow.

Livingstone and Cooper, Ltd. (s): *Registered Office and Works*, Hessle, Hull.

Lloyd Royal Belge (Gt. Britain), Ltd. (s) (*Late* Brys and Gylsen, Ltd.): *Head Offices*, 101, Leadenhall Street, London, E.C.3.

Lobnitz and Co., Ltd. (s) (m): *Head Offices*, Renfrew, Scotland.

London and Glasgow Engineering and Iron Shipbuilding Co., Ltd. (s) (m), Glasgow. *See* Harland and Wolff, Ltd.

London Graving Dock Co., Ltd. (d): *Offices*, 110, Fenchurch Street, London, E.C.3.

London, Midland, and Scottish Railway (d): *Head Offices*, Euston Station, London, N.W.1.

London and Montrose Shipbuilding and Repairing Co., Ltd. (s) (d): *Head Offices and Works*, The Shipyard, Montrose; *London Offices*, 26–28, Billiter Street, E.C.3.

London and North Eastern Railway (d): *Chief General Manager*, King's Cross Station, London, N.1.; *Dry Docks at* Grimsby, Lowestoft, and Hull.

Londonderry Port and Harbour Commissioners (d): *Offices*, Londonderry.

McAlister and Son, R. (s): *Offices*, Sandpoint, Dumbarton.

MacColl and Pollock, Ltd. (m): *Head Offices*, Wreath Quay Engineering Works, Sunderland.

MacColl and Co., Ltd. (s) (m): *Head Offices*, Queen's Road, Belfast.

McKie and Baxter (m): *Offices and Works*, Copland Works, Govan, Glasgow.

McMillan and Son, Ltd., Archibald (s): *Head Offices*, Dockyard, Dumbarton.

McNicoll Brothers (s) (d): *Offices and Works*, Kelvin Dock, Maryhill, Glasgow.

Manchester Dry Docks Co., Ltd. (s) (d): *Head Office*, Mode Wheel, Manchester.

Medway Slipway Co. (d): *Offices*, Rochester, Kent.

Menzies and Co., Ltd. (m) (d): *Offices and Works*, Leith.

Mercantile Dry Dock Co., Ltd. (d): *Offices and Works*, Jarrow-on-Tyne.

Mercantile Pontoon Co., Ltd. (d): *Head Offices*, Roath Dock, Cardiff.

Mersey Docks and Harbour Board (d): *Head Offices*, Dock Office, Liverpool.

Metropolitan-Vickers Electrical Co., Ltd. (m): *Head Offices and Works*, Trafford Park, Manchester.

Middle Docks and Engineering Co., Ltd. (d): *Head Offices and Works*, Middle Docks, South Shields.

Mildway Shipbuilding and Engineering Co. (s) (m): *Registered Offices*, Rochester, Kent.

Milford Docks Co. (d): *Offices*, 16, Victoria Street, London, S.W.1.

Mills and Knight, Ltd. (d): *Offices*, 155, Fenchurch Street, London, E.C.3.

Ministry of Transport (d): *Offices*, Whitehall Gardens, London, S.W.1.

Mistley Shipbuilding and Repairing Co. (s) (d): *Offices*, The Quay, Mistley, Essex.

Mitchison, Ltd., T. (m) (d): *Offices*, Friars Goose Slipway, Gateshead.

Monmouth Shipbuilding Co., Ltd. (s): *Head Offices and Works*, Chepstow, Mon.; *Registered Office*, Basildon House, Moorgate Street, London, E.C.2; *London Office*, 77, Gracechurch Street, E.C.3.

Morris, J. and D. (s) (d): *Offices and Works*, Pelawmain-on-Tyne.

Mumford, Ltd., A. G. (m): *Head Offices and Works*, Culver Street Engineering Works, Colchester; *London Office*, 52, Queen Victoria Street, E.C.4.

Murdock and Murray, Ltd. (s): *Head Offices*, Port Glasgow.

Napier and Miller, Ltd. (s) (m): *Head Offices*, Old Kirkpatrick, nr. Glasgow.

Noble and Co., Wilson (s): *Offices and Works*, Fraserburgh.

North British Diesel Engine Works (1922), Ltd. (m): *Offices and Works*, Whiteinch, Glasgow.

North Eastern Marine Engineering Co., Ltd. (m): *Head Offices*, Wallsend-on-Tyne; *Works at* Wallsend-on-Tyne and Sunderland; *London Offices*, 22, Billiter Street, E.C.3; *Liverpool Office*, 529, Tower Building.

North of Ireland Shipbuilding Co., Ltd. (s) (d): *Head Offices and Works*, Londonderry; *London Office*, 21, Russell Square, W.C.1; *Liverpool Office*, 630, Royal Liver Building.

Northumberland Shipbuilding Co., Ltd. (s): *Head Offices*, 77, Gracechurch Street, London, E.C.3; *Registered Offices*, Basildon House, Moorgate Street, London, E.C.2.

Ocean Dry Docks Co., Ltd. (d): *Offices*, Central Drydocks, Swansea.

Osbourne, Graham and Co., Ltd. (s) (d): *Head Offices*, Hylton, nr. Sunderland.

Ouse Shipbuilding and Engineering Co., Ltd. (S): *Offices*, Hook, near Goole.

Palmers Shipbuilding and Iron Co., Ltd. (S) (M) (D); *Registered Offices*, Jarrow-on-Tyne; *Works*, Jarrow-on-Tyne and Hebburn-on-Tyne; *London Office*, 116, Fenchurch Street, E.C.3.

Parsons Marine Steam Turbine Co., Ltd. (M): *Registered Offices and Works*, Turbinia Works, Wallsend-on-Tyne; *London Offices*, 56, Victoria Street, S.W.1.

Penarth Pontoon, Slipway and Ship Repairing Co., Ltd. (D): *Offices and Works*, Penarth Dock, near Cardiff.

Philip and Son, Ltd. (S) (M) (D): *Offices*, Sandquay, Dartmouth.

Pickersgill and Sons, Ltd., William (S): *Registered Offices and Shipyard*, Southwick, Sunderland.

Pitchers, Ltd. (S): *Offices*, North Quay, Great Yarmouth.

Plenty and Son, Ltd. (M): *Offices and Works*, Eagle Iron Works, Newbury, Berks.

Pollock, Sons and Co., Ltd., James (S) (M): *Registered Offices*, 3, Lloyd's Avenue, E.C.3; *Liverpool Office*, 224, Royal Liver Building; *Shipyard*, Faversham.

Ponsharden Shipyard (S) (M) (D): *Offices and Works*, Ponsharden Shipyard, Falmouth.

Port of London Authority (D): *Head Offices*, Trinity House, London, E.C.3.

Priestman and Co, John (S): *Offices and Shipyard*, Southwick, Sunderland.

Prince of Wales Drydock Co. (Swansea), Ltd. (D): *Head Offices and Works*, Swansea; *London Office*, 34, Great St. Helens', E.C.3.

Queenstown Dry Docks, Shipbuilding and Engineering Co., Ltd. (S) (M) (D): *Head Offices*, Passage West, County Cork, Ireland; *Registered Offices*, Furness House, Leadenhall Street, London, E.C.3.

Ramage and Ferguson, Ltd. (S) (M): *Offices and Works*, West Pier, Leith.

Rankin and Blackmore, Ltd. (M): *Offices and Works*, Eagle Foundry, Baker Street, Greenock.

Readhead and Sons, Ltd., John (S) (M) (D): *Offices and Works*, West Docks, South Shields.

Rennoldson and Co., Charles (S): *Offices*, The Lawe Shipyard, South Shields.

Rennoldson and Sons, Ltd., J. P. (S) (M) (D): *Offices and Works*, South Shields.

Richardson, Duck and Co., Ltd. (S): *Offices and Works*, South Stockton Shipyard, Stockton-on-Tees.

Richardsons, Westgarth and Co., Ltd. (M): *Registered Office*, Hartlepool; *Works at* Hartlepool, Middlesbrough, and Sunderland; *Branch Offices* at London, Middlesbrough, and Sunderland.

Ritson's Shipbuilding and Engineering Co., Ltd. (S) (M) (D): *Registered Offices*, Greenland Road, Blyth, Northumberland.

River Wear Commissioners (D): *Offices*, St. Thomas Street, Sunderland.

Robb, Ltd., Henry (S) (D): *Registered Offices*, 18, Bernard Street, Leith; *Works*, Edinburgh Works, Albert Road, Leith.

Robey and Co., Ltd. (M): *Offices and Works*, Lincoln.

Rogers and Co. (S) (M): *Offices and Works*, Cremyll, Plymouth.

Rogers, Ltd., John (D): *Offices*, East Dock, Cardiff.

Rollo and Sons, Ltd. (M): *Registered Offices*, 33–41, Sandhills Lane, Liverpool; *Works*, 9, Blackstone Street, Liverpool.

Ropner Shipbuilding and Repairing Co. (Stockton), Ltd. (S) (D): *Offices and Works*, North Shore Shipbuilding Yard, Stockton-on-Tees.

Rose Street Foundry and Engineering Co., Ltd. (S) (M) (D): *Offices*, 2, Rose Street, Inverness.

Ross and Duncan (M): *Offices and Works*, Whiteinch Works, Govan, Glasgow.

Ross and Walpole, Ltd. (M): *Offices and Works*, 65–68, North Wall, Quay, Dublin.

Rowan and Co., Ltd., David (M): *Head Offices*, 231, Elliot Street, Glasgow.

Rowhedge Ironworks Co., Ltd (S) (M): *Registered Offices*, Rowhedge, near Colchester, Essex.

Rutherford and Co., Ltd., A. (S) (M): *Head Offices and Works*, Neptune Works, Bridge Street, Birkenhead.

Salter Bros., Ltd. (S): *Offices and Works*, Folly Bridge, Oxford.

Salterns, Ltd. (S) (D): *Registered Offices*, Parkstone, Poole Harbour, Dorset.

Sandford, Ltd., E. A. and H. (M): *Offices*, Thames Iron Works, Gravesend.

Scarr, Ltd., Henry (S) (M): *Head Offices*, Haven Shipyard, Hessle, Yorks.

Scarr and Sons, Ltd., Joseph (S): *Head Office*, Grove Hill, Beverley.

Scarr, T. H. (S) (D): *Offices and Works*, Howden, Yorks.

Scott, D. and R. B. (M): *Offices and Works*, Abertay Works, Tayport.

Scott and Sons (S) (D): *Offices and Works*, Bowling, near Glasgow.

Scotts' Shipbuilding and Engineering Co., Ltd. (S) (M) (D): *Registered Offices and Engine Works*, Greenock Foundry, East Stewart Street, Greenock; *Shipyards*, Cartsdyke, Greenock; Cartsburn Dockyard, Greenock; *Sawmills*, Cartsdyke Saw Mills, Greenock; *London Offices*, 22, Billiter Street, E.C.3.

Scath and Co., T. B. (s): *Offices*, 121, St. Vincent Street, Glasgow.

Sharpness New Docks and Gloucester and Birmingham Navigation Co. (d): *Head Offices*, Dock Office, Gloucester.

Shields Engineering and Dry Dock Co., Ltd. (m) (d): *Offices*, North Shields.

Short Bros., Ltd. (s): *Head Offices and Shipyard*, Pallion, Sunderland; *Branch Offices*, 58, John Street, Sunderland.

Short Bros. (Rochester and Bedford), Ltd. (s): *Registered Offices*, Whitehall House, 29/30, Charing Cross, London, S.W.1; *Works*, Rochester, Kent.

Simons and Co., Ltd., Wm.: *Registered Offices*, London Works, Renfrew; *London Offices*, 83, Victoria Street, S.W.1.

Sisson and Co., Ltd., W. (m): *Offices and Works*, Elmbridge Road, Gloucester.

Smith, Ltd., Geo. and Thos. (s): *Head Offices and Works*, Rye, Sussex.

Smith's Dock Co., Ltd. (s) (m) (d): *Head Office*, High Docks, South Shields.

Southern Railway (South Western Section) (d): *Head Offices*, Waterloo Station, London, S.E.1; *Dry Docks*, Southampton.

Stephen and Sons, Ltd., Alexander (s) (m) (d): *Head Offices*, Shipbuilding Yard and Engineering Works, Linthouse, Govan, Glasgow; *Repair Works*, Govan Dry Docks Repair Works, Govan, Glasgow.

Stevenson and Asher (s) (m): *Offices and Works*, Banff.

Stothert and Co., Ltd., G. K. (s) (m) (d): *Head Offices and Works*, Steamship Works, Bristol.

Stow and Son (s) (d): *Offices*, Shoreham.

Sunderland Shipbuilding Co., Ltd. (s): *Head Offices and Shipyard*, South Dock, Sunderland.

Sulzer Bros., Ltd. (m): *Registered Offices*, 31, Bedford Square, London, W.C.1; *Works*, Winterthur, Switzerland.

Swan, Hunter and Wigham Richardson, Ltd. (s) (m) (d): *Registered and Head Office*, Wallsend Shipyard, Wallsend-on-Tyne; *London Offices*, 21, Russell Square, W.C.1, and 4, Fenchurch Avenue, E.C.3; *Liverpool Office*, Royal Liver Building; *Shipyards*, Newcastle-on-Tyne, Wallsend-on-Tyne, and Southwick, Sunderland.

Taw Shipyards, Ltd. (s): *Head Offices*, 39, Victoria Street, London, S.W.1; *Shipyard*, Barnstaple, North Devon.

Thompson and Sons, Ltd., Joseph L. (s) (d): *Head Offices and Works*, North Sands Shipbuilding Yard and Manor Quay Repairing Works, Sunderland.

Thompson and Sons, Ltd., R. (s) (d): *Registered Offices and Shipyard*, Southwick Yard, Sunderland.

Thornycroft and Co., Ltd., Sir J. I. (s) (m) (d): *Head Offices*, Thornycroft House, Smith Square, London, S.W.1; *Shipyards*, Woolston Works, Southampton; *Motor Vehicle and Marine Engineering Works*, Basingstoke, Hants.

Tyne Iron Shipbuilding Co., Ltd. (s): *Head Offices*, Willington Quay-on-Tyne.

Vickers, Ltd. (s) (m) (d): *Registered and Transfer Office*, Vickers House, Broadway, London, S.W.1; *General Works*, River Don Works, Sheffield; *Naval Construction Works*, Barrow-in Furness; *Ordnance Works*, Erith, Kent; *Dartford Works*, Dartford, Kent; *Crayford Works*, Crayford, Kent; *Weybridge Works*, Weybridge, Surrey; *Cardiff Offices*, Principality Buildings. Queen Street.

Vickers-Petters, Ltd. (m): *Offices and Works*, Ipswich.

Walker and Co., Ltd., C. H. (s). *Offices*, Sudbrook, Chepstow.

Wallsend Slipway and Engineering Co., Ltd. (s) (d): *Head Offices*, Wallsend-on-Tyne: *London Offices*, 30, Great St. Helens, E.C.3.

Watson (Gainsborough), Ltd., J. S. (s): *Offices*, Gainsborough.

Weir, Ltd., G. and J. (m): *Head Offices and Works*, Cathcart, Glasgow.

White and Co., Ltd., J. Samuel (s) (m) (d): *Head Offices*, East Cowes, Isle of Wight; *London Offices*, 28, Victoria Street, S.W.1; *Liverpool Offices*, 707–711, Royal Liver Building.

Wood, Skinner and Co., Ltd. (s): *Registered Offices and Works*, Shipyard, Bill Quay, Newcastle-on-Tyne.

Workman, Clark and Co., Ltd. (s) (m): *Head Offices*, Spencer Basin, Belfast; *Works*, North Yard, Spencer Basin; South Yard, Queen's Road; and Engineering Works, Queen's Road; Belfast.

Yarrow and Co. (1922), Ltd. (s) (m): *Head Offices and Works*, Scotstoun.

COLONIAL AND FOREIGN SHIPBUILDERS, MARINE ENGINEERS, AND REPAIRERS.

(s) Shipbuilders. (m) Marine Engineers. (d) Dry Dock Owners.

Akers Mek. Verksted. A/S (s) (m) (d): *Offices*, Dokveien 3–5, Christiania, Norway.
Alblasserdamsche Machinefabriek (m): *Offices*, Alblasserdam, Holland.
Alexander Brothers (m): *Offices*, Barcelona, Spain.
Allgemeino Electricitäts Gesellschaft (m): *Offices*, Berlin, Germany.
American Shipbuilding Co. (s) (d): *Offices*, Foot of 54th Street, Cleveland, O., U.S.A.; *Works*, Cleveland, O.; and Lorain, O., U.S.A.
Amsterdam Drydock Co. (Amsterdamsche Droogdok Maatschappij) (d); *Offices*, Amsterdam, Holland.
Ansaldo, G. and Co. (s): *Works*, Sestri Ponente and Sampierdarena, Italy.
Ansaldo, San Giorgio. *See* Società Anonima Fiat.
Ansano Shipyard (s): *Offices*, Tsurumi, near Tokyo, Japan.
Antwerp Engineering Co., Ltd. (Société Anon.) (s) (m) (d): *Offices*, Rue des Indes, Antwerp, Belgium.
Arnhemsche Stoomsleephelling Maatschappij (s) (m) (d): *Head Offices*, Stadsblokkenweg 37B, Arnhem, Holland.
Arsenale di Taranto (s): *Offices*, Taranto, Italy.
Ateliers et Chantiers de Bretagne (s) (m): *Head Office*, Prairie-au-Duc, Nantes; *Paris Offices*, 53 Rue Vivienne.
Ateliers et Chantiers de la Loire (s) (m): *Offices*, 11 bis, Boulevard Haussmann, Paris.
Ateliers et Chantiers Maritimes du Sud-Ouest (s): *Head Offices*, 73, Boulevard Haussmann; *Works*, Bordeaux.
Atlantic Coast Co. (s): *Offices*, Thomaston, Me., U.S.A.
Atlas Diesel Aktiebolaget (m): *Offices*, Stockholm; *Works*, Sickla, Sweden.
Atlas Engineering Co., Ltd. (Aktieselskabet Atlas Maskinfabrik) (m): *Registered Offices*, Copenhagen, Denmark.
Atlas Werke Aktiengesellschaft (s) (m): *Offices and Works*, Bremen, Germany.
Augsburg-Nürnberg Motorfabrik (m): *Offices and Works*, Nürnberg, Germany.
"Baanhoek," Voorheen T. Nederlof, N. V. Scheepsbouwwerf (s): *Registered Offices*, Sliedrecht, Holland.
Bacini and Scali Napoletani (m): *Offices and Works*, Naples, Italy.
Bailey and Co., Ltd., W. S. (s) (m): *Offices, Works, and Shipyard*, Kowloon Bay, Hong Kong.
Baltimore Dry Docks and Shipbuilding Co. (s) (m): *Offices and Works*, Baltimore, U.S.A.
Bath Iron Works (s) (m) (d): *Offices and Works*, Bath, Me., U.S.A.
Bergens Mekaniske Verksted, A/S (s) (m) (d): *Offices and Works*, Bergen, Norway.
Bergsunde Mek. Verkstads Aktiebolaget (s) (m) (d): *Head Offices and Works*, Stockholm, Sweden.
Bethlehem Shipbuilding Corporation, Ltd. (s) (m) (d): *Offices*, Bethlehem, Pa., U.S.A.
Blohm und Voss, Kommanditgesselschaft (s) (m) (d): *Head Offices*, Hamburg, Germany.
Boele's Shipbuilding Co. (Boele's Scheepswerven en Machinefabriek) (s) (m): *Offices*, Bolnes; *Works*, Bolnes and Slikkerveer, Holland.
Bonn and Mees (s): *Head Offices and Shipyard*, Maashaven, W.Z., Rotterdam, Holland.
Bolnes Machinefabriek (m): *Offices and Works*, Bolnes, Holland.
Borsig, A. (s): *Offices and Works*, Berlin-Tegel, Germany.
Bretagne, Ateliers et Chantiers de. *See* Ateliers, etc.
Brokeroens Skibsbyggeri (s): *Offices and Works*, Svelvik, Norway.
Brossard, Mopin and Co. (s): *Offices and Works*, Hsin Ho, China.
Burgerhout's Shipbuilding and Engineering Co., Ltd. (Burgerhout's Machinefabriek en Scheepswerf) (s) (m) (d): *Head Offices*, Rotterdam, Holland; *London Representatives*, Rowland Willis & Co., 12, St. Mary Axe, E.C.3.

Burmeister and Wain, Ltd. (Aktieselskabet Burmeister and Wain's Maskin-og Skibsbyggeri) (s) (m) (d): *Head Offices*, Copenhagen, Denmark; *London Offices*, 17/19, Cockspur Street, S.W.1.

Burn and Co., Ltd. (s) (m) (d): *Registered Offices*, 7, Hastings Street, Calcutta; *Works*, Howrah Ironworks, Howrah, Bengal, India.

Caillard et Cie (s), Le Havre, France.

Canadian Allis-Chalmers (s): *Offices and Works*, Bridgeburg, Ont., Canada.

Canadian Ingersoll-Rand Co. (s): *Offices and Works*, Sherbrooke, Quebec, Canada.

Canadian-Vickers, Ltd. (s) (d): *Head Offices*, Montreal, Canada.

Cantiere Federaleper Costruzioni Navali (s): *Registered Offices*, 2, Via San Giorgio, Genoa, Italy.

Cantiere Navale Triestino (s) (m) (d): *Registered Offices*, Monfalcone; *Branch Offices*, 10, Via Milano, Triest, Italy.

Cantiere Navali Riuniti (s) (m) (d): *Central Offices*, Via Balbi 4, Genoa, Italy.

Cantiere San Rocco S. A. (s): *Offices*, San Rocco, near Triest, Italy.

Cantieri Cersusa: *Offices and Works*, Voltri, Italy.

Castellamare Royal Dockyard (s): *Offices and Works*, Castellamare, Italy.

Chantiers de France: *Offices and Works*, Dunkirk, France.

Chantiers et Ateliers Augustin-Normand (s) (m): *Offices*, Rue du Perrey 67, Havre, France.

Chantiers Navals Belges (s): *Offices and Works*, Cruybeke, Belgium.

Chantiers Navals Français (s) (d): *Registered Offices*, Rue de Mogador, 33, Paris, France.

Chickasaw Shipbuilding Co. (s): *Offices and Works*, Mobile, Ala., U.S.A.

Christensen, H. C. (s): *Offices and Works*, Marstal, Denmark.

Christiansands Mekaniske Voerksted (s): *Offices and Works*, Christiania, Norway.

Cockerill, John, and Co. (m): *Offices and Works*, Hoboken, Belgium.

Collingwood Shipbuilding Co., Ltd. (s): *Head Offices*, Collingwood, Ont., Canada; *Dry Docks at*, Collingwood, Ont.; and Kingston, Ont

Companhia Nacional de Navegaçao Costeira (s) (d): *Registered Offices*, Avenida Rodriques Alves, Rio do Janeiro, Brazil.

Compañia Euskalduna de Construcion y Reparacion de Buques (s) (m) (d): *Offices*, Bilbao, Spain.

Copenhagen Floating Dock and Shipbuilding Co. *See* Kjöbenhavns Flydedok og Skibsvarft A/S (s) (m) (d): *Registered Offices*, Copenhagen, Denmark.

Coughlan and Sons, Ltd., John (s): *Offices and Works*, Vancouver, B.C., Canada.

Cramp and Sons Ship and Engine Building Co., William (s) (m) (d): *Head Offices and Works*, Richmond and Norris Streets, Philadelphia, Pa., U.S.A.; *Branch Offices*, 100, Broadway, New York City, N.Y., U.S.A.; *Shipyard*, Beach and Palmer Streets, Philadelphia, Pa., U.S.A.

Danziger Schichauwerft (s): *Offices and Works*, Danzig.

Davie Shipbuilding and Repairing Co., Ltd. (s) (m) (d): *Registered Offices*, Lauzon, Levis, Quebec, Canada; *Branch Offices*, Montreal, Canada.

De Laval Angturbin, Aktiebolag (m): *Offices*, Stockholm, Sweden.

"De Schelde," Koninklijke, Maats. (s): *Offices*, Flushing, Holland.

Deutsch-Luxemburgische Werft (s): *Offices and Works*, Emden, Germany.

Deutsche Werft, Aktien-Gesellschaft (s) (m) (d): *Main Offices*, Parkhotel, Teufelsbrücke, near Hamburg, Germany; *Registered Offices*, Hamburg 1, Germany.

Deutsche Werke Aktiengesellschaft (s) (m) (d): *Head Offices*, Wilmersdorf 1, Westfälischestrasse 5, Berlin W9, Germany.

Dominion Shipbuilding Co. (s): *Offices and Works*, Toronto, Ont., Canada.

"Dordrecht," Naamlooze Vennootschappij Scheepswerf ("Dordrecht" Shipbuilding Co., Ltd.): *Offices and Works*, Dordrecht, Holland.

Doullut and Williams Shipbuilding Co., Inc. (s): *Offices and Works*, New Orleans, La., U.S.A.

Downey Shipbuilding Corporation (s): *Offices and Works*, Long Island, N.Y., U.S.A.

Dyle et Bacalan (s): *Offices and Works*, Bordeaux, France.

Echevarrieta y Larrinaga (s): *Offices and Works*, Cadiz, Spain.

Eisenbeton Schiffbau (s): *Offices and Works*, Bremen, Germany.

Elbeschiffswerft (s): *Offices and Works*, Wilhelmsburg, Germany.

Elbe Nordseewerke (s): *Offices and Works*, Hamburg, Germany.

Elsinore Shipbuilding and Engineering Co. (Aktieselskabet Helsingors Jernskibs og Maskinbyggeri) (s): *Offices and Works*, Elsinore, Denmark.

Eriksbergs Works (s): *Offices and Works*, Gothenburg, Sweden.

Etablissements Caillard et Cie (m): *Offices and Works*, Rue de Prony, 20, Havre, France.

Federal Shipbuilding Co. (s) (m) (d): *Registered Offices*, Kearney, N.J., U.S.A.; *Sales Offices*, 26, Beaver Street, New York, U.S.A.; *U.K. Agents*, Chas. G. Dunn & Co., 6, Water Street, Liverpool.

Fijenoord Co. (Maatschappij voor Scheeps en Werktuigbouw Fijenoord) (s) (m): *Head Offices*, Rotterdam, Holland.

Flender Shipyard (s): *Offices and Works*, Siems, Lubeck, Germany.

Flensburger Schiffsbau-Gesellschaft (s) (m) (d): *Offices and Works*, Flensburg, Germany.

Fredriksstad Mek. Verksted Aktieselskabet (s): *Offices and Works*, Fredriksstad mek. Verksted, Fredriksstad, Norway.

Frerischswerft (m): *Offices and Works*, Einswarden, Germany.

Frichs, A/S. (s) (m): *Offices and Works*, Aarhus, Denmark; *Branch Office*, 21, Frederiksgade, Copenhagen.

Fuginagata Shipyard (s): *Offices and Works*, Osaka, Japan.

Fuller and Co., George A. (s): *Offices and Works*, Wilmington, U.S.A.

Gall und Seitz (s): *Offices*, Hamburg, Germany.

Ganz and Co., Danubius (s) (m) (d): *Head Offices*, Budapest, Hungary; *Works*, Ratibor, Upper Silesia; Leobersdorf, near Vienna, Austria; *Wharves at* Kraljevica, Serbia.

Gebrüder Sachsenberg (s): *Offices*, Rosslau, Germany.

General Electric Co. (m): *Offices and Works*, Schenectady, N.Y., U.S.A.

Giessen and Zonen, G. Van Der (s): *Offices*, Krimpen, Holland.

Götaverken, Aktiebolaget (s) (m) (d): *Offices and Works*, Gothenburg, Sweden.

Great Lakes Engineering Works (s) (m) (d): *Head Offices*, River Rouge, Mich.; *Shipyards*, River Rouge, Mich., and Ashtabula, Ohio; *Engine Works*, Detroit, Mich., U.S.A.

Groningen Scheepsverft and Machinefabriek (s) (m): *Offices and Works*, Groningen, Holland.

Gutehoffnungshütte (m): *Offices*, Oberhausen, Germany.

Halifax Shipyards, Ltd. (d): *Offices and Works*, Halifax, Canada.

Harma Jernstoperi and Mek. Verkstad (m): *Offices*, Harma, Norway.

Holeby Diesel Engine Works, Ltd. (m): *Registered Offices and Works*, Holeby, Denmark; *Branch Offices*, 9, Vœrnedamsvej, Copenhagen, Denmark.

Hong Kong and Whampoa Dock Co., Ltd. (s))m) (d): *Head Offices*, Queen's Buildings, New Praya, Hong Kong.

Hooven, Owens, and Rentschler Co. (m): *Head Offices*, Hamilton, Ohio, U.S.A.

Howaldtswerke (s) (m) (d): *Offices and Works*, Kiel, Germany.

Inglis, J., and Co. (m): *Offices*, Toronto, Ont., Canada.

Ishikawajima Shipbuilding and Engineering Co. (s) (m): *Offices*, Tokyo, Japan.

Kawasaki Dockyard Co., Ltd. (s) (m) (d): *Registered and Head Office*, Kobe, Japan: *Engineering, Drydocking, Repairing, and Shipbuilding Works at* Kobe, Japan; *Branch Offices and Works*, Hyogo, Kobe; Fukiai, Kobe; and Dairen, North China.

Kiangnan Dock and Engineering Works (s) (m) (d): *Offices and Works*, Shanghai, China.

King and Co., Ltd., John (s) (m): *Offices and Works*, Howrah, India.

Kobe Steel Works (s) (m) (d): *Head Offices*, Kobe, Japan; *Branch Offices*, The Moji Brass Foundry, Komorie, Moji, Japan; Tokyo Kaijo Building, Yurakucho, Kojimachi-Ku, Tokyo, Japan; and No. 4, Shioiro Yokosuka, No. 6, Sakaigawa, Kure, Japan.

Koninklijke Maatschappij De Schelde. *See* De Schelde.

Kremer, John D. W. (s): *Offices*, Elmshorn, Germany.

Krupp Aktien-Gesellschaft Germaniawerft, Fried. (m): *Head Offices and Works*, Kiel-Gaarden, Germany.

Larvik Slip and Verksted (s) (m) (d): *Offices and Works*, Larvik, Norway.

Limhamns Sheppsvarv Aktiebolag. (s): *Offices and Works*, Limhamn, Sweden.

Lindholmen-Motala Aktiebolaget (s) (m) (d): *Head Offices and Works*, Gothenburg, Sweden.

Llewellyn Iron Works (s): *Offices*, Los Angeles, Cal., U.S.A.

Lobithsche Scheepsbouw Maatschappij, Voorheen Gebroeders Bodewes, N.V. (Lobith Shipbuilding Co.) (s) (m): *Registered Offices*, Lobith, Holland; *Agent in England*, R. Paterson, "Eastwood," Cottingham, E. Yorks.

Los Angeles Shipbuilding and Dry Dock Co. (s) (m) (d): *Registered Offices*, San Pedro, Cal., U.S.A.; *Branch Offices*, 401, Balfour Building, 351, California Street, San Francisco, Cal., U.S.A.

Lübecker Machinenbau Gesellschaft (s) (m) (d): *Offices and Works*, Lübeck, Germany.

Marinens Hovedverft (s): *Offices*, Hortens, Norway.

Maskin-och Brobyggnads Aktiebolaget (s) (m) (d): *Head Offices and Works*, Helsingfors, Finland.

Merchant Shipbuilding Corporation (s): *Works*, Bristol, Pa., U.S.A. (2 yards).

Meyer's Shipbuilding Co., J. (s): *Offices and Works*, Zalt Bommel, Holland.

Midland Shipbuilding Co., Ltd. (s): *Registered Offices and Works*, Midland, Ontario, Canada.

Mitsubishi Zosen Kaisha, Ltd. (s) (m) (d): *Head Office*, 1, 1-Chome, Yaesu-cho, Kojimachi-Ku, Tokyo; *Works*, Nagasaki and Kobe, Japan.

Mitsui Bussan Kaisha, Ltd. (s) (d): *Offices*, 3, Kaigandori, Kobe, Japan.

Mitsui and Co. (s): *Works*, Tama, Inland Sea, Japan.

Moller, A. P. (m): *Works*, Odense Shipyard, Denmark.

Monica, A. (m) : *Works*, Figueira da Foz, Portugal.

Moore Dry Dock Co. (s) (m) (d): *Head Offices*, 803, Balfour Building, San Francisco, U.S.A.; *Works*, Oakland, Cal., U S.A.

Moss Værft, Aktieselsk (s) (m) (d); *Registered Offices*, Moss, Norway.

Nakskov Skibsværft (s) (d): *Offices*, Nakskov, Denmark.

"Neptun," Actien-Gesellschaft, Schiffsbau und Maschinenfabrik (s) (m) (d) : *Head Offices*, Rostock, Germany

Netherlands Shipbuilding Co. (Nederlandsche Scheepsbouw Maatschappij) (s): *Head Offices and Shipyard*, Conradstraat, Amsterdam, Holland; *London Offices*, 82-83, Fenchurch Street, E.C.3.

New Burrell-Johnson Works (s): *Offices and Works*, Yarmouth, N.S., Canada.

New Engineering and Shipbuilding Works, Ltd. (s) (m) (d): *Head Offices*, 45, Yangtszepoo Road, Shanghai, China.

Newport News Shipbuilding and Dry Docks Co. (s) (m) (d): *Head Offices*, 233, Broadway, New York, U.S.A.; *Works*, Newport News, Va., U.S.A.

New York Shipbuilding Corporation (s) (m): *Head Offices and Works*, Camden, New Jersey, U.S.A.; *Branch Offices*, 1, Broadway, New York, U.S.A.

New Waterway Shipbuilding Co. (Scheepsbouw Maatschappij "Nieuwe Waterweg") (s) (m) (d): *Offices and Works*, Schiedam, Holland.

Nicolo Odero and Co., Foce (s) : *Offices and Works*, Genoa, Italy.

Nitta Shipyard (s): *Offices and Works*, Osaka, Japan.

Nobellessner Co. (s): *Offices and Works*, Reval, Esthonia.

Nobiskong Werft (s): *Offices and Works*, Rendsberg, Germany.

Norddeutsche Union Werke (s): *Offices and Works*, Tonning, Germany.

Norddeutsche Werft (s): *Offices and Works*, Bremerhaven, Germany.

North-West Bridge and Iron Co. (s) : *Offices and Works*, Portland, Or., U.S.A.

Nusche & Co., A. G. (s) (d): *Offices and Works*, Grabow, Stettin, Germany.

Nylands Verksted (s) (m) (d): *Offices and Works*, Christiania, Norway.

Odero, Fu Aless. and Co., N. (s): *Offices and Works*, Sestri Ponente, Italy.

Oderwerke (s): *Offices and Works*, Stettin, Germany.

Ono Shipyard (s): *Offices and Works*, Osaka, Japan.

Oresunds-varvet, Aktiebolaget (s) (m): *Registered Offices and Works*, Landskrona, Sweden.

Orlando, Fratelli (s): *Offices and Works*, Leghorn, Italy.

Orlogsvarftet (s): *Offices and Works*, Copenhagen, Denmark.

Osaka Ironworks, Ltd. (s) (m) (d) : *Head Offices*, Dojina, Kita-Ku, Osaka; *Works at* Sakurajima, Osaka; Innoshima; and Bingo, Japan.

Oskarshamns Mekaniska Verkstads Och Skeppsdockas Aktiebolag. (s) (m) (d): *Offices and Works*, Oskarshamn, Sweden.

Ostzee werft Schiffbau und Maschinenfabrik A. G. (s) (d): *Works*, Frauendorf, Stettin, Germany.

Ottensener Werke (m): *Offices and Works*, Frauendorf, Stettin, Germany.

Pacific Coast Shipbuilding Co. (s): *Offices and Works*, Bay Point, Cal., U.S.A.

Pattison, C. and T. T. (Officine e Cantieri Napoletani) (s) (m): *Offices*, Naples, Italy.

Poole and Steel (s) (m): *Head Offices*, Stephen Street, Balmain, Sydney, N.S.W.; *Branch Offices*, Osborne, Port Adelaide, Australia.

Port Union Shipbuilding Co. (s): *Offices and Works*, Newfoundland.

Pusnœs Stoberi and Mek. Verksted (m): *Offices and Works*, Arendal, Norway.

Randolph Skibsbijggeri Fevig (s): *Offices and Works*, Norway.

Reiherstieg Werft (s): *Offices and Works*, Hamburg, Germany.

Rosenberg Mek. Versted, A/S (s) (d) : *Offices and Works*, Stavanger, Norway.

Rotterdamsche Droogdok Maatschappij (Rotterdam Dry Dock Co.) (s) (m) (d): *Head Offices and Works*: Rotterdam, Holland; *London Agents*, Peel, Boundy and Co., Billiter House, Billiter Street, E.C.3.

Sandvikens Skeppsdocka (d): *Offices and Works*, Helsingfors, Finland.

San Rocco, Cantiere. *See* Cantiere San Rocco.

Schichau, F. (s) (m) (d) : *Offices and Works*, Elbing, Danzig.

Schneider et Cie. (s): *Head Offices*, 42, Rue d'Anjou, Paris; *Principal Works*, Le Creusot, Le Breuil, "Henri Paul" le Havre, Harfleur, le Hoc, Champagne-sur-Seine, et la Londe-les-Maures; *Shipyards*, Chalon-sur-Saône, France.

Seebeck and Co., Georg (Aktien-Gesellschaft, Schiffswerft, Maschinenfabrik und Trockendocks) (s) (m) (d): *Head Offices*, Bremerhaven-Geestemünde, Germany; *Works*, Geestemünde (Shipbuilding); Bremerhaven (Ship-repairing).

Selvik Skibsværft (s): *Offices and Works*, Selvik, Norway.

Shalimar Works, Ltd. (s) (m) (d): *Head Offices*, 63, Foreshire Road, Sibpur Howrah, Bengal, India; *Registered Offices*, 6, Lyons Range, Calcutta, India; *Works at* Jharia and Chittagong, Howrah, India.

Shanghai Dock and Engineering Co., Ltd. (s) (m) (d): *Head Offices*, 26, Broadway, Shanghai, China; *London Agents*, H. J. Stockton and Co., Ltd., 16, Philpot Lane, E.C.3.

Skiens Verkstedr. (s): *Offices and Works*, Skiens, Norway.

Solvesborgs varvs. & Rederiak (s) (m) (d): *Offices and Works*, Sölvesborg, Sweden.

Smulders, A. F. *See* Werf Gusto.

Società Anonima Bacini e Scali Napoletani (d): *Offices and Shipyard*, Via Marinella, Naples, Italy.

Società Anonima Fiat Stabilimento Grandi Motori (m): *Head Offices*, Via Cuneo 20, Turin, Italy.

Société Anonyme des Anciens Chantiers Dubigeon (s): *Head Offices and Works*, Nantes-Chantenay, France.

Société Anonyme des Anciens Etablissements Groignard (d): *Offices*, Boulevard des Bassins, Cap-Pinede, Marseilles, France.

Société Anonyme des Ateliers Duchesne et des Ateliers Bossière (m) (d): *Registered Offices*, 30 Rue J. J. Rousseau, Havre, France.

Société Anonyme des Ateliers et Chantiers Maritimes du Boulonnais (s) (m): *Offices*, Boulevard de Chatillon, Boulogne, France.

Société Anonyme des Chantier et Ateliers de Saint Nazaire, Penhöet (s) (m): *Head Offices*, 6 bis, Rue Auber, Paris 9e, France; *Works*, Chantier de Penhöet, Saint Nazaire-sur-Loire; and Chantier de Normandie, Grand-Quévilly, près Rouen, France.

Société Anonyme des Chantiers et Ateliers de la Gironde (s) (d): *Head Offices*, 3 Rue Montalivet, Paris.

Société Anonyme des Chantiers et Ateliers de Provence (s) (m): *Head Offices*, 40 Chemin de la Madraque, Marseilles, France.

Société Anonyme des Forges et Chantiers de la Méditerranée (s) (m): *Head Offices*, 25, Boulevard Malesherbes, Paris, France.

Société Anonyme de Travaux Dyle et Bacalan (s) (m) (d): *Registered Offices*, Chantiers de Bordeaux, 5, Rue Achard, Bordeaux, France.

Société des Ateliers et Chantiers de France (s) (m) (d): *Works and Shipbuilding Yard*, Dunkerque; *Registered Offices*, Rue La Boëtie, 5, Paris, France.

Société des Ateliers Lorientais (s): *Head Offices*, Rue de la Victoire 56, Paris, France.

Société Franco-Chinoise de Constructions Métalliques et Mécaniques (s) (m) (d): *Head Offices*, 9, Quai de France, Shanghai, China; *Paris Offices*, 9, Rue de Seze.

Société Marseillaise de Constructions Mécaniques (s) (d): *Offices and Works*, Marseilles, France.

Société Provençale de Constructions Navales (s) (m) (d): *Registered Offices*, 3, Rue Montalivet, Paris, France.

South-Western Shipbuilding Co. (s): *Offices and Works*, San Pedro, Cal., U.S.A.

Stabilimento Tecnico Triestino (s) (m) (d): *Head Offices*, Trieste, Italy; *Works*, Cantiere San Marco, Italy (Shipbuilding); Fabbrica Macchine Sant' Andrea, Italy (Engineering).

Standard Shipbuilding Corporation (s): *Offices and Works*, New York, U.S.A.

Standifer Corporation, G. M. (s): *Works*, Vancouver, Wash., U.S.A.

Stavanger Stoberi & Dok (s) (m) (d): *Offices and Works*, Stavanger, Norway.

Straten Island Shipbuilding Co. (s): *Offices and Works*, Straten Island, N.Y., U.S.A.

Stuhr's Works, P. Ph. (s): *Offices and Works*, Aalborg, Denmark.

Stulcken Sohn, H. C. (s): *Offices and Works*, Hamburg, Germany.

Submarine Boat Corporation (s): *Offices and Works*, Newark, New Jersey, U.S.A.

Sulzer Frères (m): *Head Offices and Works*, Winterthur, Switzerland; *London Offices*, 31, Bedford Square, W.C.2; *Manchester Offices*, 21, Spring Gardens; *Swansea Offices*, Castle Buildings.

Sun Shipbuilding Co. (s): *Works*, Chester, Pa., U.S.A.

Svendborg Skibsværft (s): *Offices and Works*, Copenhagen, Denmark.

Svenska Turbinfabriks Aktiebolaget Ljungström (m): *Registered Offices*, Finspong, Sweden.

Taikoo Dockyard and Engineering Co. of Hong Kong, Ltd. (s) (m) (d): *Head Offices*, Hong Kong.

Tampa Shipbuilding and Engineering Co. (S) (M) (D): *Offices*, Foot of Water Street, Tampa, Fla., U.S.A.

Tecklenborg, Joh. C. (S) (M) (D): *Offices and Works*, Geestemunde, Germany.

Texas Steamship Co. (S): *Offices and Works*, Bath, Maine, U.S.A.

Thompson and Co. (Castlemaine) Proprietory, Ltd. (S) (M) (D): *Head Offices*, Castlemaine, Victoria, Australia; Shipbuilding and Ship-repairing *Works*, Williamstown, Victoria; *Engineering Works*, Castlemaine, Victoria.

Tidewater Shipbuilding Co. (S): *Offices and Works*, Three Rivers, Quebec, Canada.

Todd Shipyards Corporation (S) (M) (D): *Registered Offices*, 25, Broadway, New York, N.Y., U.S.A.; Brooklyn and Tacoma, U.S.A.

Trondhjems Mekaniske Vœrksted (S) (M) (D): *Head Offices*, Inderredveien, 18, Trondhjem, Norway; *Branch Works*, Trolla Bruk, Trondhjem, Norway.

Uchida Shipbuilding Co. (S): *Offices and Works*, Yokohama, Japan.

Union Construction Co. (S) (M): *Offices*, Foot of 14th Street, Oakland, Cal., U.S.A.

Union Shipbuilding Co. (S): *Offices and Works*, Baltimore, U.S.A.

United Engineers, Ltd. (S) (M) (D): *Head Offices*, Damar Road, Singapore, Straits Settlements.

United Machine Factories (M): *Works*, Prague, Bohemia.

Unterweser Schiffbau (S): *Offices and Works*, Lebe, Germany.

Uraga Dock Co. (D): *Offices and Works*, Kobe, Japan.

Vaxholmsvarvet (S): *Offices and Works*, Ramso, Norway.

Vuijk und Zonen, A. (S): *Head Offices*, Kralingscheveer, near Rotterdam; *Works*, Kralingscheveer, near Rotterdam, and Capelle, a/d Ysel, Holland.

Vulcan Ironworks Co. (S): *Offices and Works*, Jersey City, N.J., U.S.A.

Vulcan Werft (Hamburg und Stettin) Actiengesellschaft (S) (M) (D): *Head Offices*, Hamburg 9; *Works*, Stettin and Hamburg, Germany.

Walkers, Ltd. (S): *Head Offices and Works*, Maryborough, Queensland, Australia.

Wallace Shipyards, Ltd. (S) (M) (D): *Shipyard and Main Offices*, North Vancouver, B.C.; *City Office*, Credit Foncier Building, Vancouver, B.C.; *Foundry*, Industrial Island, Vancouver, B.C., Canada.

Werf Conrad (S) (M): *Offices and Works*, Haarlem, Holland; *London Office*, Friar's House, 39/41, New Broad Street, E.C.3.

Werf de Noord (S): *Offices and Works*, Alblasserdam, Holland.

Werf Gusto (A. F. Smulders) (S): *Offices and Works*, Schiedam, Holland.

Werf Zeeland, N. V. (S): *Offices and Works*, Hansweert, Holland.

Werkspoor Engine Works (S): *Head Offices*, Amsterdam; *Works*, Amsterdam and Zuilen, near Utrecht, Holland.

"Weser" Aktien-Gesellschaft (S) (M) (D): *Registered Offices*, 18, Werftstrasse, Bremen 13, Germany.

Westinghouse Electric and Manufacturing Co. (M): *Registered Offices*, East Pittsburgh, Penn, U.S.A.

Winton Engine Works (M): *Offices and Works*, Cleveland, Ohio, U.S.A.

Yokohama Dock Co. (D): *Offices and Works*, Yokohama, Japan.

Zeeland, Werf, Holland. *See* Werf Zeeland.

THE STEAMSHIP SERVICES OF THE WORLD.

All lines run return journeys in reverse order to services given, except where otherwise stated.

(Particulars of the Steamship Lines and Companies mentioned will be found in the List of "British and Foreign Shipowners," p. 643.)

AFRICA, EAST.

British India Line; from London and Middlesbrough to Principal Ports of East Africa (*passengers and cargo*).

Clan Line; from Glasgow, Liverpool and Newport to Madagascar (*passengers and cargo*).

Compagnie Havraise Péninsulaire de Navigation à Vapeur; from Havre and Marseilles to Madagascar (East Coast), Réunion and Maurice Isle (*passengers and cargo*); from Havre, Bordeaux, and Marseilles to Madagascar (West Coast) and Mozambique (*passengers and cargo*).

Deutsche Ost-Afrika Linie; from Hamburg to Madeira, Canary Islands, and Chief East African Ports (*passengers and cargo*).

Hall Line; from Glasgow and Liverpool to all East African Ports (*passengers and cargo*).

Hamburg-Amerika Linie; from Hamburg to Madeira, Canary Islands, and Chief Ports of East Africa (*passengers and cargo*).

Hamburg-Bremen-Afrika Linie; from Hamburg to Madeira, Canary Islands, and Chief East African Ports (*passengers and cargo*).

Harrison Line; from Birkenhead and Glasgow to Principal Ports of East Africa (*cargo*).

Houlder Bros. and Co., Ltd.; from England to Chief East African Ports (*passengers and cargo*).

Houston Line; from Middlesbrough, London, Glasgow, and Liverpool to Chief East African Ports (*passengers and cargo*).

Union-Castle Line; from London and Southampton to all East African Ports (*passengers, mail, and cargo*).

Woermann-Linie, Aktien-Gesellschaft; from Hamburg to Madeira, Canary Islands, and Chief East African Ports (*passengers and cargo*).

AFRICA, SOUTH.

Aberdeen Line; from London and Plymouth to Durban, Cape Town, and Port Elizabeth (*passengers and cargo*).

British Africa Shipping and Coaling Co., Ltd.; from London and Plymouth to Durban and Cape Town (*passengers and cargo*).

Clan Line; from Glasgow, Liverpool, and Newport to Cape Town, Port Elizabeth and Durban (*passengers and cargo*).

Deutsche Ost-Afrika Linie; from Hamburg to Madeira, Canary Islands, and Chief South African Ports (*passengers and cargo*).

Ellerman and Bucknall Steamship Co., Ltd.; from United Kingdom (*weekly cargo services*); from Australia (*fortnightly cargo sailings*); from New York to Cape Town, Port Elizabeth, and Durban (*fortnightly cargo sailings*).

Furness, Withy and Co., Ltd. *See* Prince Line.

Hall Line; from Glasgow and Liverpool to Cape Town, Mossel Bay, Algoa Bay, East London, Natal, Delagoa Bay, and Mauritius (*cargo*).

Hamburg-Amerika Linie; from Hamburg to South Africa (*cargo and passengers*).

Hamburg-Bremen-Afrika Linie; from Hamburg to Madeira, Canary Islands, and Chief South African Ports (*passengers and cargo*).

Harrison Line; from Birkenhead, Glasgow and Newport (*cargo*).

Houlder Bros. and Co., Ltd.; from London and Plymouth to Cape Town, Durban, and Port Elizabeth (*passengers and cargo*).

Houston Lines; from United Kingdom and from United States (*both cargo services, carrying a few passengers*).

Natal Line of Steamers, Ltd.; from London and Plymouth to chief South African Ports (*passengers and cargo*).

Peninsular and Oriental Service to Australia; from London to Adelaide, Melbourne, and Sydney *viâ* Cape Town (*passengers, one class only, mails and cargo*).

Prince Line; from New York to South African Ports (*cargo*).

Shaw, Savill and Albion Co., Ltd.; from London to Australia, *viâ* the Cape of Good Hope (outwards, *general cargo;* homewards, *a large amount of meat and dairy produce in cold storage*).

Union-Castle Line; from London and Southampton to Beira, Chinde, Cape Town, Port Natal, and East London (*passengers, mails, and cargo*).

White Star Line; from Liverpool to Australia, calling at Cape Town (*passengers and cargo*).

Woermann-Linie, Aktien Gesellschaft; from Hamburg to Madeira, Canary Islands, and Chief South African Ports (*passengers and cargo*).

AFRICA, WEST.

African Steamship Co.; from Liverpool and London to principal West African Ports (*passengers and cargo*).

British and African Steam Navigation Co., Ltd.; from Liverpool and Rotterdam to principal West African Ports (*passengers and cargo*).

Deutsche Ost-Afrika Linie; from Hamburg to Madeira, Canary Islands, and Chief West African Ports (*passengers and cargo*).

Elder, Dempster and Co. Ltd.; from Liverpool, London, and Rotterdam to principal West African Ports (*passengers and cargo*).

Hamburg-Amerika Linie; from Hamburg to West Africa (*passengers and cargo*); Hamburg to South West Africa (*passengers and cargo*).

Holt and Co. (Liverpool), Ltd ; from Liverpool to principal West African Ports (*passengers and cargo*).

Houston Lines; from London, Glasgow, and Liverpool (*passengers and cargo*).

Union-Castle Line; from London and Southampton to Port Amelia, Mozambique, Réunion, Mombassa, and Zanzibar (*passengers, mails, and freight*).

Woermann-Linie, Aktien-Gesellschaft; from Hamburg to Madeira, Canary Islands, and Chief West African Ports (*passengers and cargo*).

AMERICA, CENTRAL.

Blue Funnel Line. *See* Alfred Holt and Co.

Canadian Pacific Railway Co.; from Montreal and Quebec (summer), St. John (winter), to Havana, Cuba, *viâ* Boston (*passengers and cargo*).

Canadian Government Merchant Marine, Ltd.; Montreal to Havana, Cuba (*cargo*); Montreal to Nassau, Kingston (Ja.), Jamaica and Belsize (B.H.) (*passengers and cargo*); Montreal to Barbados, Trinidad, and British Guiana (*cargo*). During the winter these services operate from Halifax, N.S.

Clyde Steamship Co.; from New York to Santo Domingo City and Azua, *viâ* Turks Island, calling at Monte Cristo, Puerto Plata, Samana, Sanchez, La Romana, and Macoris (*passengers and cargo*).

Cuban Line; from Antwerp and London to the Ports of Central America (*passengers and cargo*).

Davies Steamship Co., W. R.; from London to Panama (*passengers and cargo*).

Elders and Fyffes; from Avonmouth and Easton to Panama (*cargo*).

Furness Line; from New York to Bermuda (*passengers and cargo*); New York to West Indies (*passengers and cargo*); from New York to Trinidad (*passengers and cargo*).

Furness, Withy and Co., Ltd. *See* Furness Line.

Hamburg-Amerika Line; from Hamburg to Cuba and Mexico (*passengers and cargo*); from Hamburg to West Indies (*passengers and cargo*); from Hamburg to West Coast Ports, *viâ* Panama (*passengers and cargo*).

Harrison Line; from Glasgow to West Indies and Demerara (*cargo*); from London to West Indies and Demerara (*cargo*); from Swansea, Glasgow, and Liverpool to North Pacific Ports, *viâ* Panama Canal (*cargo*); from Liverpool to West Indies, Mexico, and Brazil (*cargo*).

Holt and Co., Alfred; from Liverpool (part loading at Glasgow, Bristol Channel Ports, Hamburg, and Bremen) to the Straits Settlements, Philippines, China, Japan, Korea, East Siberia, Kingston (Jamaica), Pacific Coast, United States, and Canada, passing through the Panama Canal (*passengers and cargo*).

Houston Lines; from River Plate Ports to United States and Canada, calling at Cuba (*cargo service, carrying a few passengers*).

Hugo Stinnes Linien; from Hamburg to Cuba and Mexico (*passengers and cargo*).

Larrinaga Line; from Liverpool to Antilla, Cardenas, Cienfuegos, Cuba, Havana, Mantanzas, Sagua la Grande, and Santiago de Cuba (*passengers, freight, and mails*).

Leyland Line; from Liverpool, London, and Manchester to Panama (*passengers and cargo*).

New York and Porto Rico Steamship Co. *See* Porto Rico Line.

New Zealand Shipping Co., Ltd.; from London through the Panama Canal to New Zealand and Australia.

Panama Rail Road Steamship Co.; from New York, Port au Prince (Hayti), to Cristobal (Canal Zone, Panama) (*passengers and cargo*).

Porto Rico Line; from New York to San Juan, Ponce, and Mayaguez (*freight and passengers*); from New Orleans to San Juan, Ponce, and Mayaguez (*freight*).

Royal Mail Steam Packet Co.; from London and Hull to West Indies and British Guiana (*cargo only*); from Hull and London to Jamaica (*cargo only*); from Hull and London to Hayti and Domingo (*cargo only*); from Hull and London to Colon and Central American Pacific Ports (*cargo only*); from Hull, Bremen, and Rotterdam to Havana and Galveston (*passengers, mails, and cargo*); from St. John, N.B., and Halifax, N.S., to Bermuda, West Indies, and Demerara (*passengers, mails and cargo*).

Shaw, Savill and Albion Co., Ltd.; from London through the Panama Canal to New Zealand; this service is run in conjunction with the White Star Line (*passengers and cargo*).

Stinnes Linien. *See* Hugo Stinnes Linien.

White Star Line, jointly with Shaw, Savill and Albion Co., Ltd.; from London to New Zealand *viâ* Panama Canal (*passengers and cargo*).

AMERICA, SOUTH.

"Artus" Line. *See* Hugo Stinnes Linien.

Booker Line; from Liverpool to principal South American Ports (*cargo*).

Booth Line; from Havre, Liverpool, Lisbon, London and Madeira, to principal South American Ports (*passengers and cargo*).

British and Argentine Steam Navigation Co., Ltd.; from Liverpool to River Plate Ports (*passengers and cargo*).

Canadian Government Merchant Marine, Ltd.; Montreal to Santos, Rio de Janeiro, Monte Video, and Buenos Aires (*cargo*). During the winter months this service operates from Halifax, N.S.

Compania Naviera Sota y Aznar (Spanish Line); from Hamburg to Rio de Janeiro, Santos, Monte Video and Buenos Aires.

Cornborough Shipping Line, Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Davies Steamship Co., W. R.; from Liverpool to principal South American Ports (*cargo*).

Donaldson South American Line; from Glasgow, Liverpool, and London to Monte Video and Buenos Aires—also by transhipment to other River Plate Ports (*refrigerated cargo*).

Grace Lines; from New Orleans to Ports of Equador, Peru, and Chile (*passengers, cargo, and mails*).

Furness-Houlder Argentine Lines, Ltd.; from London and Liverpool to chief Ports of Argentine and Uruguay (*refrigerated cargo and a few first-class passengers*).

Furness, Withy and Co., Ltd. *See* Prince Line and Furness-Houlder Argentine Lines.

Hall Line; from Calcutta to River Plate Ports (*cargo*).

Hamburg-Amerika Line; from Hamburg to Brazil and La Plata Ports (*passengers and cargo*).

Hamburg-Südamerikanische Dampfschiffahrts-Gesellschaft; from Hamburg to Brazil, Uruguay, and Argentina (*passengers*).

Henderson and Co., Ltd.; from Glasgow to principal South American Ports (*cargo*).

Holland and Co., Ltd., Arthur; from Newport to principal South American Ports (*cargo*).

Houlder Bros. and Co., Ltd.; from Antwerp, London, Liverpool, and Bristol to Monte Video, Buenos Aires, and Rosario, calling *en route* at Las Palmas or Teneriffe (Outwards, *general cargo and passengers;* Homewards, *frozen and chilled meat, dairy produce, general cargo, and passengers*).

Houston Lines; from Glasgow and Liverpool to River Plate; from United States to River Plate; from Canada to River Plate; from West Indies to River Plate (*all cargo services, carrying a few passengers*).

Hugo Stinnes Linien; from Hamburg to Portuguese Ports, Pernambuco, Monte Video, Buenos Aires, and Rosario (in association with the "Artus" Line, Danzig) (*passengers and cargo*).

Kaye, Son and Co., Ltd.; from Liverpool to principal South American Ports (*cargo*).

Koninklijke Hollandsche Lloyd; from Amsterdam to Buenos Aires, calling *en route* at Southampton, Cherbourg, La Corunna, Vigo, Leixoes, Lisbon, Las Palmas, Pernambuco, Bahia, Rio de Janeiro, Santos, and Monte Video (*passengers, mails, and freights*).

Lamport and Holt; from Liverpool, Glasgow, and Manchester to Brazil, *viâ* Portugal; from Liverpool and Glasgow to the River Plate, *viâ* Spain; from Middlesbrough, Hamburg, Antwerp, London, and Cardiff to Brazil and the River Plate; from New York to North Brazil; from New York to Central and South Brazil; from New York to River Plate Ports; from New Orleans to Brazil and River Plate; from Glasgow, Liverpool, and Havre to the West Coast Ports of South America (*cargo*); from New York to Brazil and the River Plate, calling at the West Indies (*passengers*).

Leeds Shipping Co., Ltd.. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

MacIver Line; from London to principal South American Ports (*cargo*).

Nelson, Ltd., H. and W.; from London to Buenos Aires, calling on the outward journey at Boulogne, Corunna, Vigo, Rio de Janeiro, and Monte Video, and on the homeward journey at Monte Video and Las Palmas; from Liverpool to Buenos Aires, calling at Monte Video, and at Las Palmas on the homeward voyage (*cargo, passengers, and mails*).

Oakwin Steam Ship Co., Ltd. *See* Smith and Sons Ltd., Sir. Wm. Reardon.

Prince Line, Ltd.; from London, Middlesbrough, and Antwerp to River Plate Ports (*cargo*); from New York to River Plate Ports (*cargo*); from New York to Brazil (*cargo*).

Ritson, F. and W.; from Glasgow, Liverpool, and London to principal South American Ports (*cargo*).

Roland-Linie, Aktien Gesellschaft; from Bremen and Hamburg to Chile, Peru, and Ecuador (*passengers and cargo*).

Rotterdam-Zuid Amerika Lijn; from Hamburg, Rotterdam, and Antwerp to Buenos Aires, Monte Video, Santos, Rio de Janeiro, Bahia, and Pernambuco, calling at Bilbao, Santander, and Vigo (*cargo, carrying a few passengers*).

Royal Mail Steam Packet Co.; from Southampton to Buenos Aires, calling at French, Spanish, and Portuguese Ports, Madeira, Las Palmas, Teneriffe, St. Vincent (C.V.) and the Ports of Brazil, Uruguay, and Argentina (*mails, passengers, and cargo*), and similar service from Liverpool; from London to Rio de Janeiro, calling at Hamburg, Antwerp, Hull, and Swansea (*cargo only*), and similar service to Santos; from Hull and London to Buenos Aires (*cargo only*); from Hull and London to Demerara in British Guiana (*cargo only*); from Hull and London to Cristobal and Columbia (*cargo only*); from Barry and Swansea to Rio de Janeiro and Santos (*cargo only*); from St. John, N.B., and Halifax, N.S., to Bermuda, West Indies, and Demerara, British Guiana (*passengers, mails, and cargo*).

St. Just Steamship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Shaw, Savill and Albion Co., Ltd.; from London to New Zealand, proceeding on the outward journey *viâ* the Panama Canal, and on the homeward journey *viâ* Cape Horn, calling at Monte Video and Teneriffe (*cargo, and meat and dairy produce in cold storage on homeward voyage*).

Smith and Sons, Ltd., Sir Wm. Reardon; from United Kingdom and Continent to River Plate Ports (*cargo*).

Sota y Aznar; from Hamburg, Rotterdam, Antwerp, and Bilbao to Pernambuco, Bahia, Rio de Janeiro, Santos, Monte Video, and Buenos Aires (*cargo*).

Stinnes Linien. *See* Hugo Stinnes Linien.

Toyo Kisen Kaisha; from Hong Kong, Moji, Kobe, Yokohama, Honolulu, and Hilo to San Francisco, Portland, Los Angeles, Salina Cruz, Balbao, Callao, Mollendo, Arica, Iquique, and Valparaiso (*passengers and mails*).

AUSTRALIA AND NEW ZEALAND.

Aberdeen Line; from London and Plymouth to Melbourne, Sydney, Brisbane and Fremantle; calling at Teneriffe and Cape Town (outward), and Durban, Cape Town and Teneriffe (homeward) (*passengers and cargo*).

Adelaide Steamship Co., Ltd.; between Queensland Ports, Sydney, Newcastle, Melbourne, Adelaide, Albany, and Fremantle (*cargo and stock*); between Port Adelaide, Spencer's Gulf, and West Coast Ports (*passengers, cargo, and stock*).

Anderson, Green and Co., Ltd. *See* Orient Line.

Australian Steamships Pty., Ltd.; between Melbourne, Sydney, Newcastle, Brisbane, Queensland Ports, Adelaide, and other South Australian Ports, Albany, Fremantle, Geraldton, and West Australian Ports, Geelong, Portarlington, Warrnambool, Portland, etc. (*passengers and cargo*).

Blue Funnel Line. *See* Holt and Co., Alfred.

British India Line; from London to Fremantle, Adelaide, Melbourne, Sydney, and Brisbane; from Gulf of Mexico to Australian and New Zealand Ports (*passengers and cargo*).

Burns, Philp and Co., Ltd.; between Sydney, Queensland Ports, Darwin, Jarva, and Singapore; between Sydney, Lord Howe Island, Norfolk Island, and New Hebrides; between Sydney, Brisbane, Solomon Islands, and New Britain; between Sydney, Queensland, Papua, and Rabaul; between Sydney and New Britain direct (*mails, passengers, and cargo*).

Canadian-Australian Line. *See* Canadian Pacific Railway Co.

Canadian Government Merchant Marine, Ltd.; from Vancouver (*cargo*); from Montreal (*cargo*). During the winter months the Service from Montreal operates from Halifax, N.S.

Canadian Pacific Railway Co., in conjunction with the Canadian-Australian Line; from Vancouver to Honolulu, Suva, Fiji, Auckland, N.Z., and Sydney, Australia (*passengers and cargo*).

Commonwealth and Dominion Line; from London, Middlesbrough, Hull, and Antwerp to Auckland, Wellington, Lyttelton, and Dunedin, N.Z., *viâ* the Panama Canal; from London, Middlesbrough, Hull, Antwerp, and Hamburg to Melbourne, Sydney, Newcastle, N.S.W., Brisbane, Hobart and Launceston *viâ* Cape. From New York to Australia and New Zealand *viâ* the Panama Canal. Homewards from Australia and New Zealand to U.K. and Continent (*cargo and passengers*).

Commonwealth Government Line of Steamers; from Antwerp, Bristol, Glasgow, Hull, Liverpool, London, Middlesbrough, and Newport to Fremantle, Perth, Adelaide, Hobart, Launceston, Melbourne, Sydney, Newcastle (N.S.W.), and Brisbane (*cargo*); from London to Fremantle, Adelaide, Melbourne, Sydney, and Brisbane, *viâ* Port Said and Colombo (*passengers and cargo*); from United Kingdom Ports to Brisbane, Sydney, and Melbourne *viâ* Panama (*cargo*).

Cornborough Shipping Line, Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Cunard Line; from Bristol, Liverpool, London, and Queenstown to all the chief Ports of Australia and New Zealand (*passengers and cargo*).

Eastern and Australian Steamship Co. Ltd. to Adelaide, Hobart, Melbourne, and Fremantle (*passengers and cargo*).

Ellerman and Bucknall Steamship Co., Ltd.; from London (*monthly cargo services*); from New York (*monthly cargo services*); from South Africa (*fortnightly cargo services*).

Federal Steam Navigation Co., Ltd.; from London and West Coast Ports of Great Britain to Principal Ports of Australia (*passengers and cargo*).

Hall Line; from Liverpool to principal Australian Ports (*passengers and cargo*).

Henderson and Co., Ltd.; from Glasgow and Liverpool to principal Australian Ports (*cargo*).

Holt and Co., Alfred; from Glasgow and Continental Ports to Adelaide, Melbourne, Sydney and Brisbane (homeward calling at Liverpool and London in addition); from Singapore to West Australian Ports (*passengers and cargo*).

Leeds Shipping Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Liverpool Line to Australia; from Liverpool to Fremantle, Adelaide, Melbourne, Sydney, Newcastle, Brisbane, Auckland, Wellington, Lyttelton and Dunedin; from Manchester to same ports (*passengers and cargo*).

London Line; from Bristol, Glasgow, Liverpool, and London to principal Australian Ports (*passengers and cargo*).

McIlwraith, McEacharn's Line; from Sydney to Melbourne, Adelaide, Albany, and Fremantle (*cargo*).

New Zealand Shipping Co., Ltd., from London, *viâ* the Panama Canal, to principal Australian and New Zealand Ports (*mails, passengers, and cargo*).

Oakwin Steamship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Orient Line to Australia; from Tilbury to Fremantle, Adelaide, Melbourne, Sydney, and Brisbane, calling at Gibraltar, Toulon, Naples, Port Said, and Colombo, also on the return journey at Plymouth. At certain seasons of the year the vessels call at Hobart, Tasmania (*passengers, cargo, and mails for Commonwealth of Australia*).

Peninsular and Oriental Service to Australia; from London to Adelaide, Melbourne, and Sydney, *viâ* Cape Town (*passengers—one class only—mails and cargo*).

Peninsular and Oriental Steam Navigation Company; four-weekly service from London to Fremantle, Adelaide, Melbourne, and Sydney, calling at Gibraltar, Marseilles, Port Said, Aden, and Colombo, and homewards also at Plymouth (*passengers, mails, and cargo*).

St. Just Steamship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Shaw, Savill and Albion Co., jointly with White Star Line; from London to Port Chalmers *viâ* Panama Canal, calling at Auckland, Wellington, and Lyttleton (*passengers, mails, and cargo*); from London to New Zealand, proceeding on the outward journey *viâ* the Panama Canal, and on the return journey *viâ* Cape Horn, and calling at Monte Video and Teneriffe (*cargo*).

Shire Line; from Glasgow to principal Australian Ports (*cargo*).

Smith and Sons, Ltd., Sir Wm. Reardon; from United Kingdom and Continental Ports to New Zealand (*cargo*).

Trinder, Anderson and Co.; from London to principal Australian Ports (*cargo*).

Turnbull, Martin and Co.; from London to principal Australian Ports (*cargo*).

White Star Line; from Liverpool to Sydney, calling at Cape Town, Albany, Adelaide, and Melbourne (*passengers and cargo*); from Liverpool to Australia, direct (*cargo*); from Liverpool to New Zealand, direct (*cargo*), jointly with Shaw, Savill and Albion Co., Ltd.; from London to Port Chalmers *viâ* the Panama Canal, calling at Auckland, Wellington, and Lyttleton (*passengers, mails, and cargo*).

Workman, Arbuckle and Mackinson; from London to principal Australian Ports (*cargo*).

BALTIC AND NORTH SEA.

American-Hawaiian Steamship Co.; from Los Angeles, Portland, San Francisco, Seattle, and Tacoma to Hamburg, calling at Glasgow, Havre, Liverpool, and London (*fortnightly cargo sailings*).

Bachke and Co.; from Hull, Liverpool, London, Manchester and Swansea.

Becker and Co, Ltd.; from East and West Coast Ports of the United Kingdom to principal Baltic Ports (*passengers and cargo*).

Ben Line Steamers, Ltd.; from Leith and other Scottish Ports to Petrograd and Reval (*cargo and a few passengers*).

Bergenske Dampskibsselskab, Det.; from Glasgow, Manchester, Middlesbrough and Newcastle to Principal Ports of Norway and Sweden (*passengers and cargo*).

Brodin, Erik; from London to Principal Ports of Norway and Sweden (*passengers and cargo*).

Burton, Smart and Orford, Ltd. *See* Scandia Lines.

Cook and Son, John; from Aberdeen and Granton to principal Baltic Ports (*passengers and cargo*).

Cormack and Co., James; from Aberdeen, Dundee, Grangemouth, Leith, Montrose, and Methil to Principal Ports of Norway and Sweden (*passengers and cargo*).

Cornborough Shipping Line, Ltd. *See* Smith and Sons, Ltd., Sir Wm Reardon.

Currie Line. *See* Leith, Hull and Hamburg Steam Packet Co.

Ellerman's Wilson Line; from Grimsby, Hull, Liverpool, London, Newcastle and Swansea to Principal Ports of Baltic, Norway, and Sweden (*cargo*).

Finland Line; from Liverpool to Helsingfors (*cargo*).

Finland Steamship Co., Ltd. *See* Finska Angfartygs Aktiebolaget.

Finska Angfartygs Aktiebolaget; from Hull to Copenhagen, Helsingfors, Hangö, and Abo (*passengers and cargo*); from Stettin and Lübeck to Helsingfors and Hangö (*passengers and cargo*); from Stockholm to Helsingfors and Abo (*passengers and cargo*); from Reval to Helsingfors or Hangö (*passengers and cargo*). The foregoing lines carry mails for Germany, Sweden, and Esthonia. From Hull, London, Liverpool, and Manchester to Finnish Ports (*cargo*); from Rotterdam, Antwerp, and Copenhagen to Finnish Ports (*cargo*).

Forenede Dampskibsselskab., Det.; from Hull, London and Manchester to Ports of Scandinavia (*passengers and cargo*).

Glen and Co.; from Glasgow to Holland and Belgium (*cargo*).

Head Line and Lord Line; from Belfast, Dublin, and Pernau to Petrograd, Reval, and Riga (*chiefly cargo*); from Belfast, Dublin, Cork, and Londonderry to Hamburg, Amsterdam, Antwerp, and Rotterdam (*chiefly cargo*)

Leeds Shipping Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Leith, Hull and Hamburg Steam Packet Co., Ltd.; from Leith to Hamburg (*passengers and cargo*); from Grangemouth and Dundee to Hamburg (*cargo*); from Aberdeen and Middlesbro' to Hamburg (*cargo*); from Leith to Bremen (*cargo*); from Leith to Copenhagen (*cargo*).

Lord Line. *See* Head Line and Lord Line.

Oakwin Steamship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Preston Steam Navigation Co., Ltd.; from East and West Coast Ports of the United Kingdom to Principal Ports of Baltic and Norway (*passengers and cargo*).

Royal Mail Steam Packet Co.; from London, Hamburg, Antwerp, Hull, and Swansea to Brazil (*cargo only*); from Hull, Bremen, and Rotterdam to Havana and Galveston (*passengers, mails, and cargo*); from Hamburg, Southampton, and Cherbourg to New York (*passengers, mails, and cargo*); from Hamburg, Rotterdam, Antwerp, and London to North Pacific Ports, *viâ* Panama Canal (*passengers, mails, and cargo*).

St. Just Steam Ship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Salvesen and Co., Chr.; from Leith to Gothenburg (*cargo*); from Grangemouth to Drontheim, calling at Stavanger, Bergen, Aalesund, and Christiansund (*cargo*).

Salvesen and Co., J. T.; from Grangemouth to principal Baltic Ports (*cargo*).

Scandia Lines; from Hamburg to London (8-*day freight service*); from London to Gothenburg, Christiania, and Copenhagen (10-*day freight service*).

Smith and Sons, Ltd., Sir William Reardon; from New York, Philadelphia, and Baltimore to Bremen and Hamburg (*cargo*); from New York, Philadelphia, and Baltimore to Rotterdam and Hamburg (*cargo*).

Stott and Co., Ltd., W. H.; from London and Manchester to principal Scandinavian Ports (*cargo*).

West Hartlepool Steam Navigation Co., Ltd.; from West Hartlepool to Christiania and Stockholm (*passengers and cargo*).

CANADA.

Anchor-Donaldson Line; summer service from Glasgow to Quebec and Montreal (*passengers and cargo*); winter service, from Glasgow to St. John, N.B., Halifax, N.S., and Portland, Me. (*passenger and cargo*).

Becker and Co., Ltd. · from East and West Coast Ports of the United Kingdom to Quebec (summer), and St. John, N.B. (winter) (*cargo*).

Cairns, Noble and Co., Ltd.; from Calais, Hull, Middlesbro', Leith, and Dundee to Montreal and Portland, Maine (*cargo*); from Mediterranean Fruit Ports to St. John, N.B., and Montreal.

Canada Steamship Lines, Ltd.; from Montreal (summer), and St. John, N.B. (winter), to Newfoundland (*passengers and cargo*); from Port Arthur to Chicontimi, calling at Duluth, Fort William, Sault Ste. Marie, Sarnia, Port Colborne, Hamilton, Toronto, Kingston, Brockville, Prescott, Cornwall, Montreal, Quebec, Murray Bay, and Ladousac (*passengers and cargo*).

Canadian Government Merchant Marine, Ltd.; Montreal to Glasgow (*cargo*); Montreal to Liverpool (*cargo*): Montreal to London (*cargo*); Montreal to Swansea and Cardiff (*cargo*). (During the winter months all these services operate from St. John, N.B.)

Canadian Pacific Steamships, Ltd.; from Avonmouth, Hamburg, Havre (*cargo only*), Antwerp (*viâ* Southampton), Glasgow, Belfast, Liverpool, London, and Southampton (*viâ* Cherbourg) to Quebec and Montreal in the St. Lawrence season and to St. John in the winter season (*passengers, freight, and mails*); from London to Quebec (summer season), and St. John, N.B. (winter season) (*cargo*); from Havana and Cuba, *viâ* Boston, to Montreal and Quebec (summer), and St. John (winter) (*passengers and cargo*).

Cunard Line; from Bristol, Liverpool, London and Queenstown to Quebec, Montreal, and Halifax, N.S. (*passengers*).

Dominion Line; from Bristol and Liverpool to Quebec (summer), and St. John, N.B. (winter) (*passengers and cargo*).

Donaldson Brothers, Ltd. *See* Anchor-Donaldson Line.

Ellerman and Bucknall Steamship Co., Ltd.; from India and Java (*monthly cargo*); from the Levant (*monthly cargo*).

Furness Line; from Liverpool to St. John's and Halifax (*cargo*); from London to Montreal (*cargo*); from London to Halifax (*cargo*); from London to St. John (*cargo*).

Furness, Withy and Co., Ltd. *See* Furness Line.

Head Line and Lord Line; from Belfast, Cork, Dublin, Hamburg, Londonderry, and Rotterdam to Baltimore, Galveston, Montreal, New Orleans, Quebec, and St. John, N.B. (*chiefly cargo*).

Houston Lines; from River Plate; from India and Far East (*both cargo services, carrying a few passengers*).

Lord Line. *See* Head Line and Lord Line.

Manchester Liners, Ltd.; from Manchester to Quebec (summer), and St. John N.B. (winter) (*passengers and cargo*).

New York, Newfoundland and Halifax Steam Ship Co., Ltd.; from St. John's, Newfoundland, Halifax, Nova Scotia, and New York (*passengers, mails, and cargo*).

Preston Steam Navigation Co., Ltd.; from East and West Coast Ports of the United Kingdom to Quebec (summer), and St. John, N.B. (winter) (*cargo*).

Royal Mail Steam Packet Co.; from Bermuda, West Indies, and Demerara, British Guiana to St. John, N.B., and Halifax, N.S. (*passengers, mails, and cargo*); from Hamburg, Rotterdam, Antwerp, and London to North Pacific Ports, *viâ* Panama Canal (*passengers, mails, and cargo*).

White Star Line, in conjunction with Dominion Line; from Liverpool to Quebec and Montreal during summer season; and from Liverpool to Halifax and Portland, Me., during winter season (*passengers and cargo*).

CHINA AND JAPAN.

Ben Line Steamers, Ltd.; from Antwerp, Leith, London, and Middlesbrough to the Chief Ports of the Straits Settlements, China, and Japan (*cargo and a few passengers*).

Blue Funnel Line. *See* Holt and Co., Alfred.

British India Line; from Calcutta to Kobe and Tokyo (*passengers and cargo*).

Canadian Government Merchant Marine, Ltd.; from Vancouver to Kobe and Tokyo (*cargo*).

Canadian Pacific Railway Co.; from Vancouver to Yokohama, Kobe, Nagasaki, Shanghai, Manila, and Hong Kong (*passengers and cargo*).

China Navigation Co., Ltd.; between Hong Kong and the Chief Ports of China, Siberia, Japan, Korea, Indo-China, Siam, Straits Settlements, East Indies, and Philippine Islands (*passengers and cargo*).

Cunard Line; from Bristol, Liverpool, London, and Queenstown to Principal Ports of China and Japan (*passengers and cargo*).

Ellerman and Bucknall Steamship Co., Ltd.; from New York and Gulf Ports (*fortnightly cargo services*); from United Kingdom and Continent (*monthly cargo services*).

Furness, Withy and Co., Ltd. *See* Prince Line.

Glen Line and Shire Line; from London to Yokohama, calling at Genoa, Port Said, Penang, Port Swettenham, Singapore, Hong Kong, Shanghai, Kobe, and Nagasaki (*passengers and cargo*).

Holt and Co., Alfred; from Liverpool (part loading at Glasgow, Bristol Channel Ports, Hamburg and Bremen) to China, Japan and Korea (*passengers and cargo*).

Java-China-Japan Lijn; from San Francisco to Hong Kong, Makassar, and Cheribon to Batavia (*passengers and cargo*).

Nippon Yusen Kaisha; from Yokohama, *viâ* China, Straits Settlements, Colombo, Suez, and Marseilles to London (*passengers and cargo*).

Peninsular and Oriental Line; from London to Straits Settlements, China and Japan (*mails, passengers and cargo*) (fortnightly).

Prince Line; from New York to Straits Settlements, Philippines, China, and Japan (*cargo*).

Rickmers-Linie; from Antwerp and Hamburg to Singapore, Hong Kong, Shanghai, Kobe, Yokohama, and Vladivostock (*freight*).

Shire Line. *See* Glen Line and Shire Line.

Thomson and Co., Wm. *See* Ben Line Steamers, Ltd

FRANCE (NORTHERN), BELGIUM, ETC.

American-Hawaiian Steamship Co.; from Los Angeles, Portland, San Francisco, Seattle, and Tacoma to Antwerp, Hamburg, and Havre, calling at Glasgow, Liverpool, and London (*fortnightly cargo services*).

Bennett Line; from Goole and London to Amsterdam, Rotterdam, Calais, Dunkirk, and Hamburg (*cargo*).

Bristol Steam Navigation Co., Ltd.; from Bristol, Plymouth, and Swansea to Calais, Amsterdam, Rotterdam, Antwerp, and Hamburg (*passengers and cargo*).

British Rhineland Navigation and Transport Co., Ltd. *See* Neptune Line.

Brussels Steamship Co., Ltd.; from London to Antwerp (*cargo*).

Burnham Shipping Co., Ltd.; from Cardiff to Antwerp, Rotterdam, and Hamburg (*cargo*).

Burton, Smart and Orford, Ltd. *See* Neptune Line; and Smart's Continental Line.

Compagnie Générale Transatlantique; from Liverpool and London to Calais, Havre, Dunkirk, Rotterdam, Antwerp, and Hamburg (*passengers and cargo*).

Constantine (R. A.) and Donkin, Ltd; from Middlesbrough to Calais, Havre, Antwerp, Rotterdam, and Amsterdam (*passengers and cargo*).

Cork Steam Ship Co., Ltd.; from Liverpool, Manchester, and Southampton to Amsterdam, Rotterdam, Dunkirk, Antwerp, and Ghent; from Glasgow to Antwerp and Ghent; from Belfast to Ghent (*cargo and passengers*).

Cunard Line; from Bristol, Liverpool, London, and Queenstown to Calais, Havre, etc. (*passengers and cargo*).

Dens and Co., Ltd.; from London to Havre (*cargo*).

Ellerman and Bucknall Steamship Co., Ltd.; from Australia, Hull, and London.

Ensign Shipping Co., Ltd.; from Hull and London to Amsterdam, Rotterdam, and Hamburg (*cargo*).

Furness, Withy and Co., Ltd.; from Middlesbrough to chief Continental Ports (*cargo*).

General Steam Navigation Co., Ltd.; from East Coast Ports of England to Havre, Calais, Boulogne (*cargo*).

Gibson and Co., Ltd., George; from London to Antwerp, Rotterdam, Amsterdam, and Hamburg (*cargo*).

Great Central Railway; from Grimsby to Calais, Dunkirk, and Havre (*passengers and cargo*).

Great Eastern Railway; from Harwich to Antwerp and Flushing (*passengers and cargo*).

Great Western Railway; from Fishguard and Weymouth to Calais and Havre (*passengers and cargo*).

Harrison, Ltd., John; from London to Havre (*cargo*).

Head Line and Lord Line; Belfast, Cork, Dublin, and Londonderry to Amsterdam, Antwerp, Dunkirk, Hamburg, and Rotterdam (*chiefly cargo*).

Holland Steamship Co., Ltd.; from London and Middlesbrough to principal Dutch Ports (*passengers and cargo*).

Hutchinson, Ltd., J. P.; from East Coast Ports of England to Antwerp, Amsterdam, and Rotterdam (*cargo*).

Kaye, Son and Co., Ltd.; from London to North French Ports (*cargo*).

Lancashire and Yorkshire Railway; from Hull to Dutch Ports (*passengers and cargo*).

Limerick Steamship Co., Ltd.; from Limerick and Cork to Dunkirk, Calais, Havre, Rotterdam, Amsterdam, and Antwerp (*passengers and cargo*).

Lord Line. *See* Head Line and Lord Line.

Marine Mercantile Co., Ltd.; from East Coast Ports of England to Rotterdam, Antwerp, Amsterdam, and Havre (*cargo*).

Neptune Line; from London to Rotterdam, Cologne, and other Rhine Ports (*bi-weekly freight service*); from Hull, Goole, King's Lynn, and other U.K Ports to Rotterdam, Cologne, and other Rhine Ports (*weekly freight service*).

Ocean Belgian Steam Navigation Co., Ltd. *See* Dens and Co.

Park, Ltd., R. and J.; from London to North French Ports (*cargo*).

Rankie and Son, James; from London to Dutch Ports (*cargo*).

Royal Mail Steam Packet Co.; from Liverpool and Southampton to French, Spanish, and Portuguese Ports to Madeira, Las Palmas, Teneriffe, St. Vincent (C.V.), Brazil, Uruguay, and Argentina (*passengers, mails, and cargo*); from London, Hamburg, Antwerp, Hull, and Swansea to Brazil (*passengers, mails, and cargo*); from Hamburg, Antwerp, Rotterdam, and London to North Pacific Ports, *viâ* Panama Canal (*passengers, mails, and cargo*); from Hamburg, Southampton, and Cherbourg to New York (*passengers, mails, and cargo*).

Smart's Continental Lines; from London to Antwerp, Boulogne, Havre, and Rouen (*bi-weekly freight service*).

Steven and Co., Thos. C.; from Goole to Hamburg (*cargo*).

Walford Lines, Ltd.; from London to Antwerp, Boulogne, Ghent, Dunkirk, Havre, and Honfleur (*cargo*); from Liverpool and Manchester to Antwerp, Rotterdam, and Dunkirk (*cargo*); from Goole (York) to Treport (*cargo*).

Zeeland Steamship Co.; from London and Hull to Rotterdam (*cargo and passengers*).

INDIA, BURMAH AND CEYLON.

Anchor Line; from Glasgow and Liverpool, to Bombay, etc.

Anderson, Green and Co., Ltd. *See* Orient Line.

Anchor-Brocklebank and Well Lines; from Glasgow, Liverpool, Manchester, and Newport to Bombay and Ceylon (*passengers and cargo*).

Asiatic Steam Navigation Co., Ltd.; from Calcutta to Chittagong and Rangoon; from Calcutta to Rangoon and Moulmein; from Calcutta to Bombay *viâ* Ceylon, calling at Coast Ports; from Calcutta, Rangoon, and Madras to Port Blair (Andaman Islands) (*mails and passengers in all cases*).

Ben Line; from Antwerp, Leith, London, and Middlesbrough to Bombay, Calcutta, Madras, and Rangoon (*passengers and cargo*).

Bibby Line; from Liverpool and London to Bombay, Calcutta, Madras, and Rangoon (*passengers and cargo*).
Blue Funnel Line. *See* Holt and Co., Alfred.
British India Line; from London and Middlesbrough to Calcutta, Bombay, and Madras (*passengers and cargo*).
Canadian Government Merchant Marine, Ltd.; from Montreal (*cargo*) (during the winter months from Halifax, N.S.); from Vancouver (*cargo*).
City Line; from Glasgow and Liverpool to Principal Ports of India (*passengers and cargo*).
Clan Line; from Glasgow, Liverpool, and Newport to Calcutta and Madras (*passengers and cargo*).
Cunard Line; from Bristol, Liverpool, London, and Queenstown to Bombay, Madras, Calcutta, and Rangoon (*mails, passengers, and cargo*).
Ellerman and Bucknall Steamship Co., Ltd.; from New York (*weekly cargo services*); from Canada (*monthly cargo services*).
Furness Line; from Antwerp to Bombay (*cargo*).
Hall Line; outward services: from Liverpool to Bombay and Karachi, *viâ* Suez Canal (*passengers and cargo*); from Liverpool to Marmagao and Malabar Coast Ports, calling at Lisbon, Bombay, and for Karachi (*passengers and cargo*): these vessels sometimes load at Newport, Glasgow, and Manchester and occasionally call at Marseilles and Naples. Homeward services: from Bombay to Marseilles and Liverpool (*passengers and cargo*); from Karachi to Marseilles and Liverpool (*passengers and cargo*); from Madras Coast to Marseilles, London, and Liverpool (*cargo*); from Malabar Coast to Marseilles, London and Liverpool (*cargo*); from Rangoon to Marseilles and Liverpool (*cargo*); from Rangoon to Alexandria and Liverpool (*cargo*); from Colombo to Marseilles, London, and Liverpool (*cargo*).
Harrison Line; from Newport and Swansea to Calcutta (*cargo*).
Henderson and Co.; from Glasgow and Liverpool to Calcutta and Madras (*cargo*).
Holt and Co., Alfred; from Liverpool (*passengers and cargo*).
Houston Line: from Canada (*cargo services, carrying a few passengers*).
Mogul Steamship Co.; from Birkenhead to Calcutta (*cargo*).
Orient Line; from Tilbury the vessels call at Colombo, on their way to Australia, and also on the return voyage (*passengers, cargo, and mails for Commonwealth of Australia*).
Peninsular and Oriental Line; from London and Marseilles to Bombay and Colombo, calling at Port Said and Aden (*mails, passengers, and cargo*) (weekly); from London to Colombo and Calcutta, calling at Malta (occasionally), Port Said and Aden (*passengers and cargo*) (usually fortnightly).
Turner and Co. *See* Asiatic Steam Navigation Co., Ltd.
Topham, Jones and Railton, Ltd.; from London to Calcutta, Madras, Bombay, and Colombo (*cargo*).

THE MEDITERRANEAN, PORTUGAL, AND SPAIN.

African Steamship Co.; from Liverpool to principal Mediterranean Ports (*passengers and cargo*).
Anchor-Brocklebank Line; from Glasgow and Liverpool to Gibraltar, Tangier, Marseilles, and Algiers (*passengers and cargo*).
Anchor Line; from Glasgow and Liverpool to principal Mediterranean Ports (*passengers and cargo*).
Anderson, Green and Co., Ltd. *See* Orient Line.
Armstrong, Lord and Co.; from Ports on East Coast of United Kingdom to principal Mediterranean Ports (*cargo*).
"Artus" Line. *See* Hugo Stinnes Linie.
Bibby Line; from Liverpool and London to principal Mediterranean Ports (*passengers and cargo*).
Bland Line; from the United Kingdom to the Near East and Black Sea, calling at Alicante, Valencia, and other Mediterranean Ports (*monthly passenger and cargo services*); from the United Kingdom to Ceuta, Tetuan, Melilla, Larache, Rabat, and Kenitra (*passengers and cargo*); between Casablanca, Tangier, Gibraltar, Oran, Algiers, and Alicante (*passengers, mails, and cargo*).
British India Line; from London and Middlesbrough to principal Mediterranean Ports (*passengers and cargo*).
Burnham Shipping Co., Ltd.; from Cardiff to Marseilles, Algiers, Tangier, and Gibraltar (*passengers and cargo*).
Compagnie des Messageries Maritimes; from Port St. Louis to Marseilles, Bizerta, Alexandria, Port Said, Beyrouth, Tripoli, Caiffa, and Jaffa (*cargo*).
Compagnie Havraise Péninsulaire de Navigation à Vapeur; from Havre, Dunkirk, and Rouen to Algeria (*passengers and cargo*).

Compañia Transatlantica (Royal Mail Line of Steamers); from Liverpool to Barcelona, Cadiz, Corunna, Cartagena, Lisbon, Azores, and Vigo (*passenger, freight, and mails*).

Compañia Transmediterránea; from Cadiz to Canary Islands; from Algeciras to Ceuta; from Algeciras and Cadiz to Tangier (*passengers, cargo and mails*).

Davies Steamship Co, W. R.: from U K. Ports (*cargo*).

Dens and Co., Ltd.; from Newcastle-on-Tyne to principal Mediterranean Ports.

Dickinson and Co., Ltd., William; from the Tyne to principal Mediterranean Ports (*cargo*).

Ellerman and Bucknall Steamship Co., Ltd.; from New York (*three-weekly cargo services*).

Ellerman Lines; from Liverpool to Gibraltar, Algiers, Malta, Alexandria, Genoa, Leghorn, Naples, Palermo, Messina, Catania, Bari, Ancona, Venice, Trieste, Fiume, Patras, Piræus, Syra, Volo, Salonica, Smyrna, Constantinople, Lisbon, and Oporto (*passengers and cargo*).

Ellerman's Wilson Line; from Hull to Tangier and Algiers (*passengers and cargo*).

Furness Line; from New York to Piræus, Patras, Salonica, Constantinople, Bulgarian and Danube Ports, Smyrna and Alexandria (*cargo*).

Furness, Withy and Co., Ltd. *See* Furness Line, Johnson Line, and Prince Line.

General Steam Navigation Co, Ltd.; from London to Tangier (*cargo*).

Glen Line and Shire Line; from London to Yokohama, calling, at Genoa and Port Said (*passengers and cargo*).

Glynn and Co., Ltd.; from Liverpool to principal Mediterranean Ports (*cargo*).

Golden Cross Line; from Bristol, Cardiff, Liverpool, and Swansea to principal Mediterranean Ports (*cargo*).

Hall Line; from Glasgow and Liverpool to Aden, Mombasa, Kilnidini, Zanzibar, and ports of Madagascar and Portuguese East Africa, calling at Lisbon, Port Said, and Port Ludan (*cargo*); Beira and other East African Ports to Marseilles and Liverpool (*cargo*); Aden to Marseilles and Liverpool (*cargo*); Port Ludan to Marseilles and Liverpool (*cargo*).

Hogarth and Sons; from Glasgow to principal Mediterranean Ports (*cargo*).

Hugo Stinnes Linien; from Hamburg to Portuguese Ports, Pernambuco, Monte Video, Buenos Aires, and Rosario (in association with the "Artus" Line, Danzig) (*passengers and cargo*).

Johnson Line, Ltd.; from Liverpool, Swansea, and Antwerp to Piræus, Syra, Smyrna, Volo, Salonica, Constantinople, Bougas, Varna, Constanza, Sulina, Tulcea, Galatz, and Baila (*cargo*).

Koninklijke Hollandsche Lloyd; from Antwerp to Buenos Aires, calling *en route* at Southampton, Cherbourg, La Corma, Vigo, Leixoes, Lisbon, Las Palmas, Pernambuco, Bahia, Rio de Janeiro, Santos, and Monte Video (*passengers, mails, and cargo*).

McAndrews and Co., Ltd.; from London, Liverpool, Glasgow, Hull, Swansea, Antwerp, and Hamburg to Lisbon, Gibraltar and the Principal Ports of Spain (*cargo and a few passengers*).

Moss Line; from Liverpool, Glasgow, and Swansea to Alexandria, calling at Gibraltar, Algiers, and Malta; from Liverpool, Glasgow, and Swansea to Constantinople, calling at Gibraltar, Oran, Malta, Syra, Smyrna, Salonica, and Volo; from Liverpool, Glasgow, and Swansea to Beyrouth, calling at Casablanca, Malta, Famagusta, Sarnaca, Alexandretta, Haifa, Jaffa, and Port Said; from Liverpool, Glasgow, and Swansea to Bordeaux; from Liverpool, Glasgow, and Swansea to Casablanca and all Moroccan Ports (*all cargo services*).

Ocean Belgian Steam Navigation Co., Ltd. *See* Dens and Co.

Orient Line; from Tilbury to Colombo, Fremantle, Adelaide, Melbourne, Sydney, and Brisbane, calling at Gibraltar, Toulon, Naples, and Port Said. On the homeward voyage the vessels call at Plymouth (*passengers, cargo, and mails for Commonwealth of Australia*).

Papayanni Line; from Liverpool to principal Mediterranean Ports (*passengers and cargo*).

Peninsular and Oriental Line; from London to Gibraltar and Marseilles (*passengers, mails, and cargo*) (weekly).

Power and Co., J.; from London to principal Mediterranean Ports (*cargo*).

Prince Line, Ltd.; from Leith, London, Middlesbrough, Antwerp, and the Tyne to Tunis, Malta, Alexandria, Syra, Cyprus, and Levant (*cargo*).

Rotterdam-Zuid-Amerika Lijn; from Antwerp, Rotterdam, and Hamburg to Buenos Aires, Monte Video, Santos, Rio de Janeiro, Bahia, and Pernambuco, calling at Bilbao, Santandar, and Vigo (*cargo, carrying a few passengers*).

Royal Mail Steam Packet Co., from London to Lisbon (*cargo only*); from Swansea to Lisbon and Algave Ports (*cargo only*); from London to Madeira, Las Palmas (*passengers, mails, and cargo*); from Southampton and Liverpool to French, Spanish, and Portuguese Ports, Las Palmas, Teneriffe, St. Vincent (C.V.), Brazil, Uruguay, and Argentina (*passengers, mails, and cargo*).

Salvesen and Co., J. T.; from Grangemouth to Spanish Ports and Marseilles (*cargo*).

Shire Line. *See* Glen Line and Shire Line.

Sloman (Rob. M. Jun.) Mittelmeer-Linie; from Hamburg to Spain and Chief Mediterranean Ports (*passengers and cargo*).

Sota y Aznar; from Glasgow and Liverpool to Spanish Ports (*cargo*).

Stinnes Linien. *See* Hugo Stinnes Linien.

Strick and Co., Ltd., Frank C.; from Antwerp, London, Glasgow, and Manchester to Port Said, Aden, Bandar Abbas, Bushire, Mohammarah, Basrah, Ahway, and Bagdad (*cargo, also passengers in certain ships*).

Union-Castle Line; from London and Southampton to Canary Islands, Teneriffe, Madeira, Gibraltar, and Port Said through the Suez Canal, calling at Aden, Zanzibar, and Mombasa to Cape Town and all South African Ports and *vice versa* (*passenger, mails, and freights*).

Westcott and Lawrence Line; from Liverpool to principal Mediterranean Ports (*cargo*).

White Star Line; from New York and Boston to Genoa, calling at Azores, Gibraltar, and Naples (*passengers and cargo*).

Yeoward Line; from Liverpool to Mediterranean ports (*cargo*).

STRAITS SETTLEMENTS AND EAST INDIES.

Asiatic Steam Navigation Co., Ltd.; from Indian Ports to Principal Ports of Java (*mails and passengers*).

Ben Line of Steamers, Ltd.; from Antwerp, Leith, London, and Middlesbrough to Chief Ports of Straits Settlements, China, and Japan (*cargo and a few passengers*).

Blue Funnel Line. *See* Holt and Co., Alfred.

British India Line; from Calcutta to Singapore (*mails, passengers, and cargo*).

Compañia Transatlantica; from Liverpool to Singapore, Philippines, Manila, Ilvilo, Cebu, Cavite, and Zamboanga (*passengers, mails, and freight*).

China Navigation Co., Ltd.; between Hong Kong and the Chief Ports of China, Siberia, Japan, Korea, Indo-China, Siam, Straits Settlements, East Indies, and Philippine Islands (*passengers and cargo*).

Commonwealth Government Line of Steamers; from all Australian Ports to Java and Singapore (*cargo*).

Cunard Line; from Bristol, Liverpool, London, and Queenstown.

Ellerman and Bucknall Steamship Co., Ltd.; from New York and Gulf Ports (*fortnightly cargo service*); from United Kingdom and Continent (*monthly cargo service*); from Canada to Java (*monthly cargo service*).

Furness, Withy and Co., Ltd. *See* Prince Line.

Glen Line and Shire Line; from London to Yokohama, calling at Genoa, Port Said, Penang, Port Swettenham, Singapore, Hong Kong, Shanghai, Kobe, and Nagasaki (*passengers and cargo*).

Holt and Co., Alfred; from Hamburg, Amsterdam, and Liverpool to the Dutch East Indies; from New York to the Dutch East Indies; from Singapore to Sumatra; from West Australia to Singapore (*passengers and cargo*).

Huddart Parker, Ltd.; from Sydney, Auckland and Wellington (*mails, passengers, and cargo*).

"Konferenz-Linie"; from Bremen, Hamburg, Antwerp, and Rotterdam to Singapore and principal ports of the Far East (*passengers and cargo*).

Osaka Shosen Kaisha; from Hamburg, Antwerp, Rotterdam, London, Marseilles, and Port Said to Singapore, Hong Kong, Shanghai, Moji, Kobe, and Yokohama (*mails and passengers*).

Parker, Ltd., Huddart. *See* Huddart Parker, Ltd.

Peninsular and Oriental Line; from London and Marseilles to the Straits Settlements, China, and Japan, *via* Port Said, Aden, and Colombo (*mails, passengers, and cargo*) (fortnightly).

Prince Line; from New York to Straits Settlements, Philippines, China, and Japan (*cargo*).

Rickmers-Linie; from Antwerp and Hamburg to Singapore, Hong Kong, Shanghai, Kobe, Yokohama, and Vladivostock (*freight*).

Shire Line. *See* Glen Line and Shire Line.

Stinnes Linien, Hugo. *See* "Konferenz-Linie."

Thomson and Co. *See* Ben Line of Steamers, Ltd.

Topham, Jones and Railton, Ltd.; from Liverpool to Singapore (*cargo*).

Turner and Co. *See* Asiatic Steam Navigation Co.

Union Steam Ship Co of New Zealand, Ltd.; from Vancouver, Auckland, Suva (Fiji), and Honolulu to Sydney; from San Francisco, Wellington, Rarotonga (Cook Is.), and Papeete (Tahiti) to Sydney (*mails, passengers, and cargo*).

Weir and Co., Andrew; from Cape Town, Mossel Bay, Port Elizabeth, East London, Durban. Delagoa Bay, and Mauritius to Singapore, Bangkok, and Hong Kong (*passengers and cargo*).

Stoomvaart Maatschappij "Nedefland"; from Amsterdam, Southampton, and Genoa to Egypt, Colombo, Singapore, and Dutch East Indies (*passengers and cargo*).

UNITED STATES OF AMERICA.

American Hawaiian Steamship Co.; from Antwerp, Glasgow, Hamburg, Havre, Liverpool, and London to Portland, Los Angeles, San Francisco, Seattle, and Tacoma (*fortnightly cargo sailings*).

American Line; from Hamburg to New York (*passengers and cargo*).

Anchor Line; from Glasgow.

Atlantic Transport Co. of West Virginia; from London to New York, Philadelphia, and Baltimore (*passengers and cargo*).

Atlantic Transport Line; from London to New York (*passengers and cargo*).

Blue Funnel Line. *See* Holt and Co., Alfred.

Bristol City Line of Steamships, Ltd.; from Bristol and Swansea to New York and Baltimore (*passengers and cargo*).

Cairns. Noble and Co., Ltd.; from Calais, Hull, Middlesbro', Leith, and Dundee to Portland (Maine) (*cargo*).

Canadian Pacific Railway Co.; from Vancouver to Victoria, Albert Bay, Prince Rupert, Ketehikan, Wrangel, Junean, Skagway (*passengers and cargo*): from Vancouver to Seattle, *viâ* Victoria (*passengers and cargo*).

Cornborough Shipping Line, Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Cunard Line; from Bristol, Liverpool, London, Cherbourg, and Queenstown to New York, Boston, and Baltimore.

Clyde Steamship Co.; from New York to Jacksonville (*cargo and passengers*); from Jacksonville to Sanford Enterprise, calling at Palatka, Astor, Deland, and Orange City (*cargo and passengers*); from New York to Wilmington (*cargo*); between, Boston, Charleston, and Jacksonville (*cargo*).

Dalgleish Ltd., R. S.; from Liverpool to Galveston, New York and Newport News (*cargo*).

Donaldson Line; from Glasgow to Baltimore; from Glasgow to Newport News. Va.; from Glasgow and Liverpool to Savannah, Ga. (*cargo service only*).

Ellerman and Bucknall Steamship Co., Ltd.; Manchester to New York (*monthly cargo service*); from United Kingdom and Continent to Pacific Ports (*monthly cargo service*).

Ellerman's Wilson Line; from Antwerp to New York; from Hull to New York; from Newcastle to New York (*cargo*).

Federal Steam Navigation Co., Ltd.; from London and Liverpool to New York and Baltimore (*passengers and cargo*).

Furness Line; from Liverpool to Newport News and Norfolk (*cargo*); from London to Newport News and Norfolk (*cargo*); from Glasgow to Philadelphia (*cargo*); from Glasgow to Boston (*cargo*); from Leith and Dundee to New York (*cargo*); from Leith and Dundee to Philadelphia (*cargo*); from Leith and Middlesbrough to Baltimore (*cargo*); from New York to London (*cargo*).

Furness Philadelphia Transatlantic Line; London to Philadelphia (*cargo*).

Furness-Prince Line; from United Kingdom and the Continent to Vancouver and North Pacific Ports (*cargo*).

Furness, Withy and Co., Ltd. *See* Furness Line, Furness-Prince Line, Prince Line, Johnson Line, and Warren Line.

Hamburg-Amerika Line; Hamburg to Halifax and New York (*freight and passengers*); from Hamburg to New York (*freight*); from Hamburg to Boston, Baltimore, and Norfolk (*freight*); from Hamburg to Philadelphia and Baltimore, (*freight*).

Harrison Line; from Glasgow, Liverpool, and Swansea *viâ* Panama Canal to California, Oregon, Washington, and North Pacific Ports (*cargo*).

Head Line and Lord Line; from Belfast, Dublin, Cork, and Londonderry to New Orleans, Galveston, Baltimore, Montreal, and Quebec (*chiefly cargo*).

Holland American Line; from Rotterdam, Boulogne, and Plymouth to New York (*mails, passengers and cargo*).

Holt and Co., Alfred: from Far Eastern Ports to New York; from the Dutch East Indies to New York; from Liverpool to New York (*passengers and cargo*).

Houston Lines; from River Plate; from South Africa (*both cargo services, carrying a few passengers*).

International Navigation Co., Ltd.; from Liverpool to Philadelphia, calling at Queenstown; from Antwerp to New York, calling at Cherbourg and Southampton (*Red Star Line Service*).

Johnson Line, Ltd.; from Liverpool to Baltimore (*cargo*).

Lamport and Holt; from the River Plate and Brazil to New York, *viâ* the West Indies (*passengers*); from North Brazil to New York; from Central and South Brazil to New York; from the River Plate Ports to New York; from Brazil to New Orleans (*passengers and cargo*).

Leeds Shipping Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Leyland Line; from Liverpool to Boston; from Liverpool to New Orleans; from London to Boston; from Manchester to Philadelphia (*all services carry both passengers and cargo*).

Lord Line. *See* Head Line and Lord Line.

Manchester Liners, Ltd.; from Manchester and Liverpool to New York (*passengers and cargo*).

Morgan Line. *See* Southern Pacific Steamship Lines.

New York, Newfoundland, and Halifax Steamship Co., Ltd.; between St. John's, Newfoundland, Halifax, Nova Scotia, and New York (*passengers, mails, and cargo*).

Norfolk and North American Steam Shipping Co., Ltd.; from London to New York (*passengers and cargo*).

Oakwin Steamship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Prince Line, Ltd.; from London to New Orleans (*cargo*); from Havre to New York (*cargo*).

Red Star Line Service *See* International Navigation Co., Ltd.

Royal Mail Steam Packet Co.; from Hamburg, Southampton, and Cherbourg to New York (*passengers, mails and cargo*).

St. Just Steam Ship Co., Ltd. *See* Smith and Sons, Ltd., Sir Wm. Reardon.

Smith and Sons, Ltd., Sir Wm. Reardon; from Liverpool and London to New York, Philadelphia, and Baltimore; from Bremen and Hamburg to New York, Philadelphia, and Baltimore; from Rotterdam and Hamburg to New York, Philadelphia, and Baltimore (*all cargo services*).

Southern Pacific Steamship Lines; from New York to New Orleans; from Havana to New Orleans (*passengers and cargo*).

Toyo Kisen Kaisha; from Hong Kong, Honolulu, Yokohama, Kobe, Dairen, Nagasaki, Shanghai, and Manila to San Francisco (*passengers and mails*).

Warren Line; from Liverpool to Boston (*cargo*).

White Star Line; from Liverpool and Queenstown to New York (*passengers, cargo and Royal and United States Mail Services*); from Southampton and Cherbourg to New York (*passengers and cargo*); from Liverpool to New York (*cargo and live stock*); from Liverpool and Queenstown to Boston (*passengers and cargo*); from Liverpool and Queenstown to Philadelphia (*passengers and cargo*); from Liverpool to Halifax and Portland, Me. (*passengers and cargo*), in conjunction with Dominion Line; at regular intervals during winter and, during summer season, from Liverpool to Quebec and Montreal.

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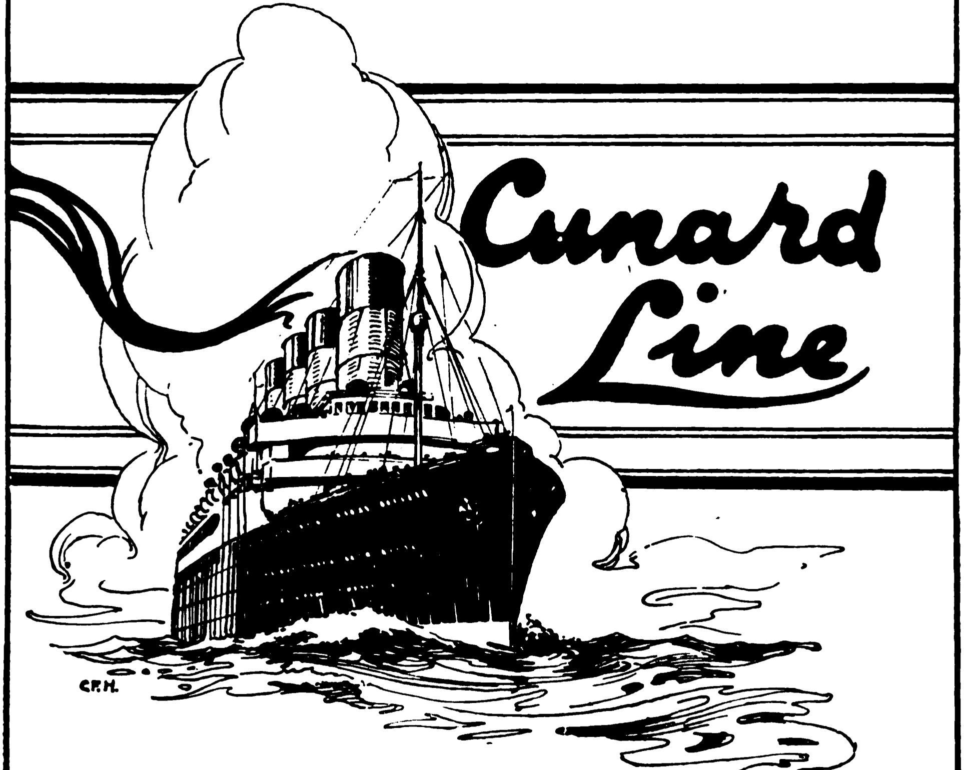

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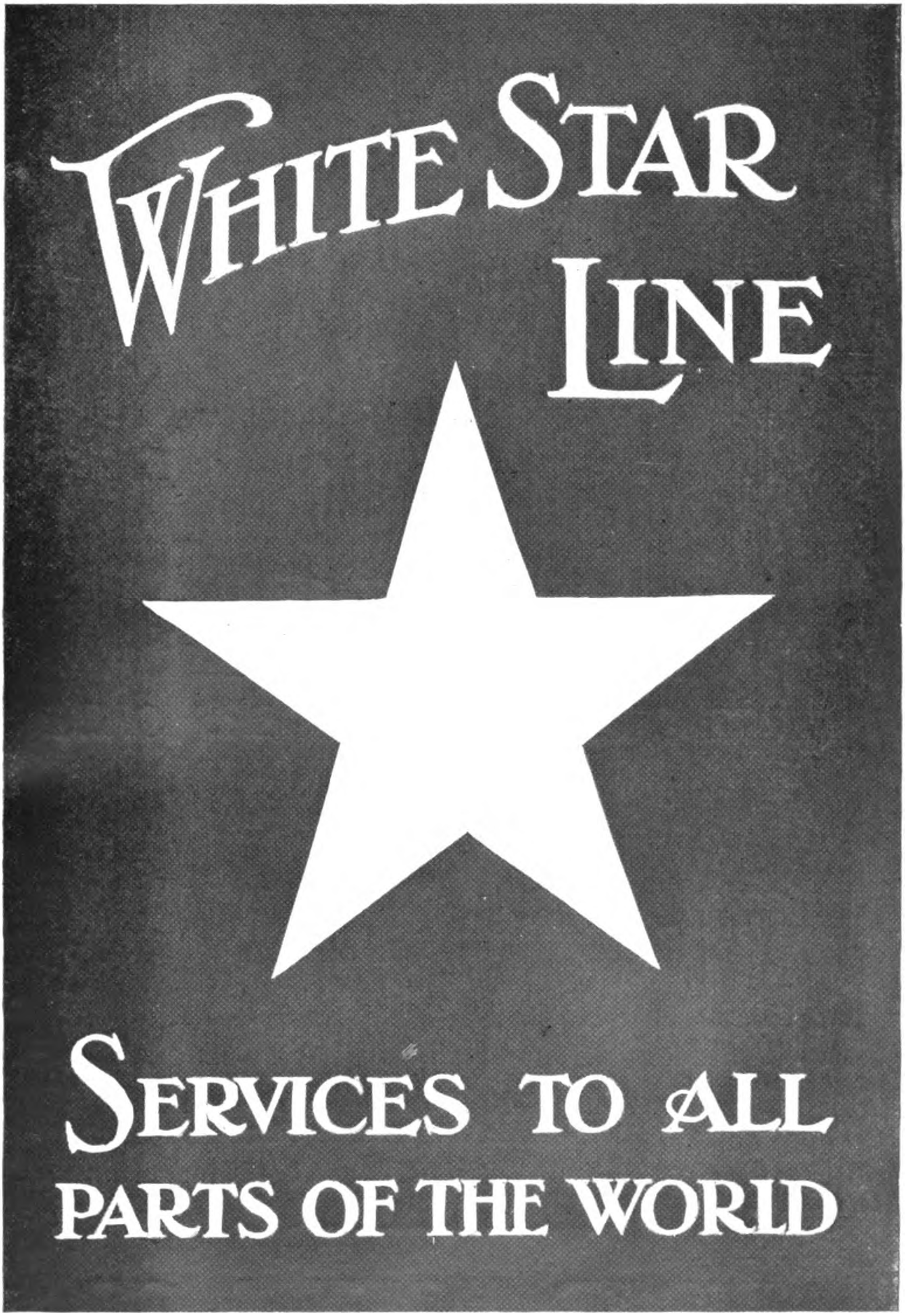

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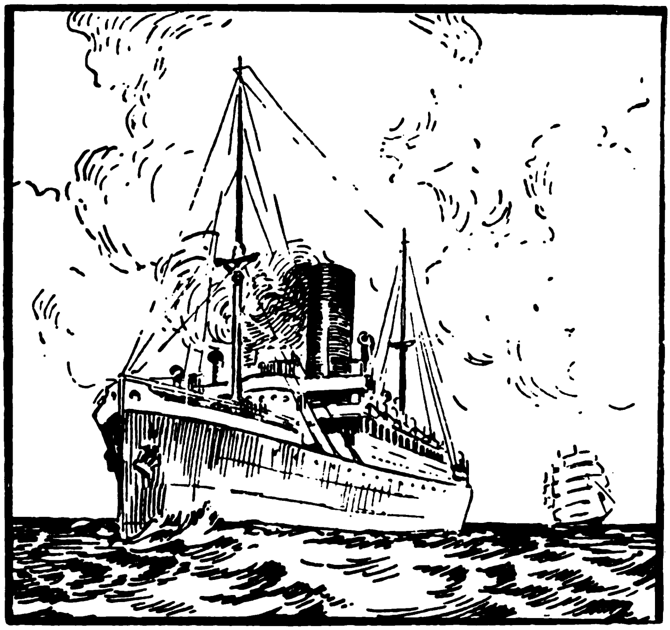

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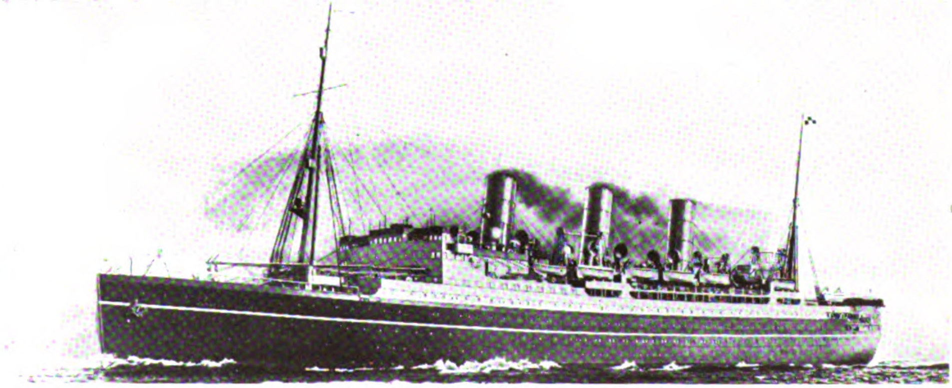

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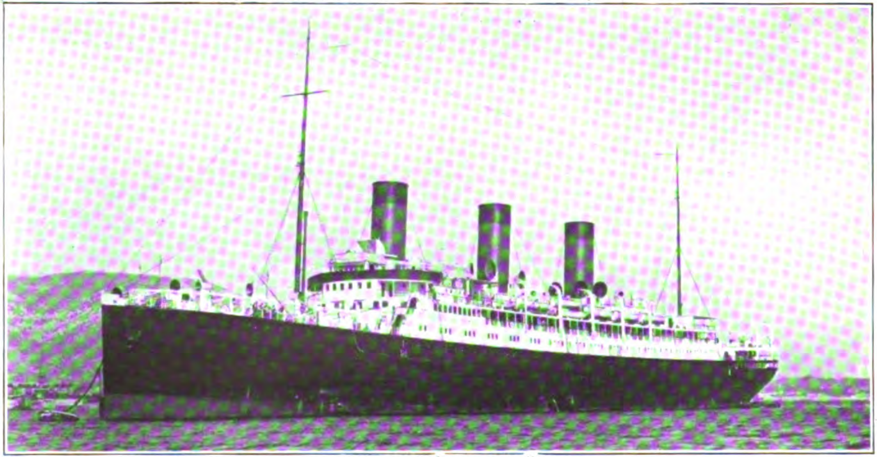

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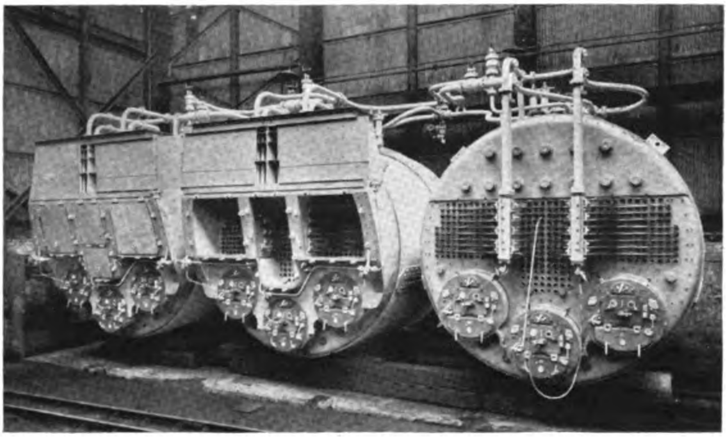

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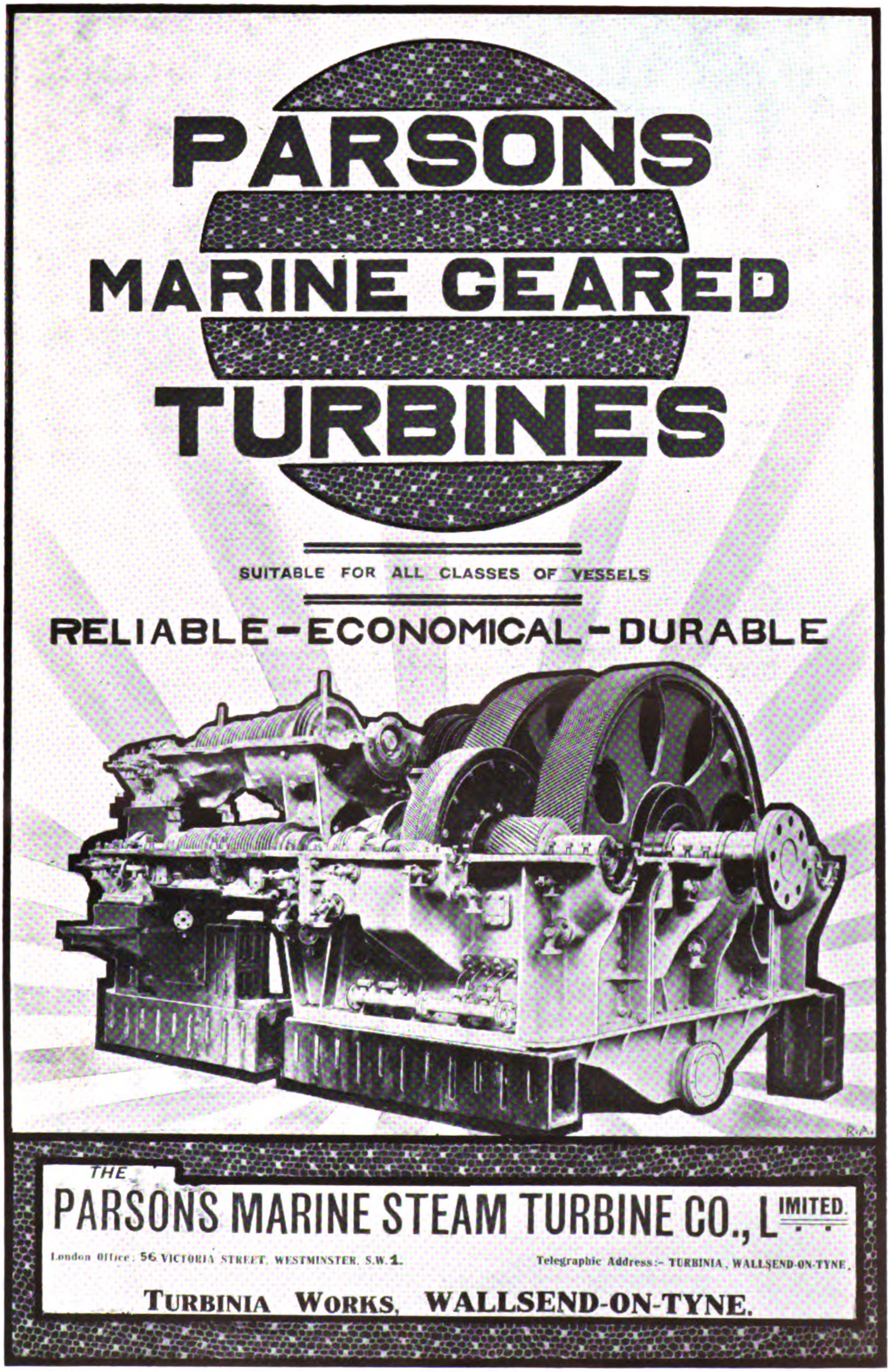

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